COLORADO PLATEAU

RAPID ECOREGIONAL ASSESSMENT

(Memorandum I-2-c)

DATA IDENTIFICATION & EVALUATION

Prepared for:
Department of Interior
Bureau of Land Management
Rapid Ecological Assessments

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This document submitted for review and discussion to the Bureau of Land Management and as such does not reflect BLM policy or decisions.

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AB STRACT

Memorandum I-2-a provides a summary of the Colorado Plateau Rapid Ecoregional Assessment (REA) Data Identification and Evaluation task. The objectives of Task I.1.2 are to identify, evaluate, and ultimately recommend datasets which will be required to assess current status of a suite of ecological systems, species, sites, and ecological function and service conservation elements, and to forecast changes in status at two future time horizons: 2025 and 2060. The conservation elements were identified and finalized during Task I.1.1. Another important objective at this stage is to identify data gaps and to solicit suggestions from workshop participants.

This process involved a review of each management question and a consideration of the general assumed approach that will be required in the assessment phase. Groups of related management questions were defined and a conceptual model developed to articulate the general relatiohships between conservation elements, change agents, and environmental context. Using the assumptions regarding the approaches required and the conceptual models, we conducted a data needs assessment. This was followed by a review of the data provided to Dynamac by BLM on a portable hard drive. Data matching those identified in the needs assessment were recommended for evaluation. In addition, the Dynamac team conducted searches to fill preliminary data gaps. Due to the large number of data layers identified, the evaluation process is ongoing. This report marks the beginning of an iterative data identification process that will continue through the Data Identification and Evaluation Workshop to the Work Plan Preparation stage. Additional data needs may arise as revisions are made to approaches and methods selected in Task 3.

We have identified data for many specific conservation elements which remain to be evaluated. The memorandum is divided into 5 sections: Sections I and II, introduction and review of Task I.1; Section III, data needs assessment; Section IV, data identification and evaluation; Section V, preliminary data gaps; and Section VI, a brief discussion. The majority of the memorandum is presented in the form of tables. We have completed evaluation of 137 data sources as of October 18, 2010, and identified numerous others that will be discussed at Workshop 2. A large fraction of these layers represent current or future anthropogenic disturbance. Most of the preliminary data gaps fell into the broad category of conservation elements. It appears that these data will likely need to be drawn from a number of available sources. Several data gaps may not easily be filled without modeling. We expect that a number of additional datasets will be suggested during the second Workshop by workshop participants to fill these data gaps. The complete results of the data evaluations accompany this memorandum in an EXCEL file "Data_Evaluations_20101018_WCODES_COP.xlsx".

RECONCILIATION OF COMMENTS Following Workshop 2, October 27–28, 2010

The sections below outline the major areas of revision suggested by Workshop 2 participants and USGS peer reviewers. Some elements occur in the body of the text but are repeated here for convenience; these entries are followed by the section of the memo in which the changes appear. Many suggestions were made on specific data sources that should be investigated, see Workshop Summary.

Data Acquisition and Evaluation (Discussion, Section VI)

The intention of Task I-2 was to identify and evaluate all of the data needed for this REA. The linear nature of tasks and deliverables complicated the data search, since the data that will be required is largely dependent on the methods to be used and methods will not be identified and approved until Task I-3. The selection of a final set of useful data layers to address the various classes of management questions was delayed by the huge number of available datasets. Including the required and recommended datasets listed by BLM, we have accumulated several hundred candidate data layers. Ideally, each data layer should be opened, inspected, and evaluated according to 11 quality criteria to choose the ones with the highest confidence scores. The Dynamac team found the evaluation process to be very time-consuming. The process was complicated by the redundancy in data layers. For example, there are approximately 50 data layers in the category of energy development alone. Which ones are the best to use? Many additional promising data layers were suggested by the participants in Workshop 2 and they remain to be incorporated and evaluated.

As a result of the challenges described, it became apparent that completion of the data identification and evaluation step was not realistic within the time and level-of-effort constraints inherent to the REA process. As a result, the AMT agreed to extend the data identification and evaluation stage through Task 3 and 4 of the REA and to delay the formal evaluation of data layers until they were formally accepted for the modeling effort. Memo I-2-c therefore represents a status report of data evaluations conducted through 18 October, 2010. A lesson learned from these early REAs might be for BLM to fund a sub-assessment to have groups of similarly-themed data layers evaluated to choose the best ones and then provide the best of the basic layers, such as energy development or agriculture, in the required or recommended list.

Attribution Accuracy (Discussion, Section VI, Appendix 1)

A major theme at the workshop was the accuracy of the major vegetation data layers, SW ReGAP and LANDFIRE. The Dynamac team showed an example of the differences in extent and attribution of various riparian vegetation classes for the same location. Some workshop participants were strongly in favor of using the GAP data, which they considered more accurate. Fire specialists naturally preferred LANDFIRE for fire-related questions. Two possible solutions are 1) to use SW ReGAP for all vegetation questions and LANDFIRE for fire-related questions with the risk of having incomparable results or 2) perform a cross-walk between SW ReGAP and LANDFIRE. The crosswalk would require rewriting the code for LANDFIRE using biophysical information from SW ReGAP. We expect that this would be too time-consuming to be accomplished within the REA framework. This issue is extremely important to resolve, as it will influence our proposed approaches, methods, and tools, as well as time estimates for Task I-3 related to ecological systems, fire, invasive species, and species habitat mapping.

Data Tables (Data Needs, Data Evaluation, and Data Gaps sections)

Controlling the number of data tables and finding a clear way to present 400 data layers in was a challenge. There were several options for presenting the data in a logical fashion. The generalized data needs tables were meant to progress into more detailed tables in the evaluation and gaps sections of the Memo. We did not rearrange the tables for this version of the memo. The data acquisition and evaluation

phase of the REA is ongoing and the table entries will change accordingly over the next few months. Also, the rapid nature of the tasks in the REA forces us to move on; we will have another opportunity to consolidate and rearrange tables for the Workplan to improve flow and understanding. At that time, we will also reconsider incorporating the data needs rationale into the body of the text.

Climate Data

The AMT advised the Dynamac team that climate change data would be forthcoming from USGS. These data were provided after Workshop 2. Because of this, there was no systematic search for climate change data.

The sections below outline the major areas of revision suggested by Workshop 2 participants and USGS peer reviewers. Some elements occur in the body of the text but are repeated here for convenience; these entries are followed by the section of the memo in which the changes appear.

Aquatic and Terrestrial Sites of High Biodiversity (Appendix 7)

Natural Heritage sites and sites noted in State Wildlife Action Plans were deleted from the list of Sites of Conservation Concern because of a lack of mappable data.

Wildlife Conservation Elements (Appendix 6)

The initial selection of wildlife species conservation elements created considerable debate at the first Workshop. The debate centered on the selection process, the rationale for inclusion of vulnerable or endemic species, and the mixing of vulnerable species and species managed for game. In preparation of Memo I-1-c and for the first workshop, the Dynamac team filled out the species list with representatives of various taxa and included all of the species on the AMT's list as desired species. Following Workshop 1, the AMT recommended that wildlife conservation elements be separated into categories: sensitive species, which would be depicted as a richness-function (species diversity hotspots); up to a dozen landscape wildlife species; and a set of desired species. It was suggested that the landscape species be screened using the Coppolillo method (Coppolillo et al. 2004) because it is systematic and fairly objective.

However, participants at Workshop 2 continued to suggest additional species of unrepresented taxa or habitats. The AMT and workshop participants agreed to add the flannelmouth sucker (*Catostomus latipinnis*) as a representative of mid-elevation streams and the ferruginous hawk (*Buteo regalis*), an additional, sensitive raptor.

USGS review comments suggest that the species selection method should be focused on identifying species that will be susceptible to change. The Dynamac team agrees that the selection of species that are sensitive to disturbance will provide the best picture of status and condition at the ecoregional level with respect to habitat alteration, displacement, and stressors associated with human disturbance. The Dynamac team has considerable experience using wildlife species as indicators of condition (fish, macroinvertebrates, and birds). Although examples of using terrestrial species as indicators of condition are scant in the literature, we expect that the consideration of methods and the literature review accompanying Phase 3 will reveal more about the sensitivity or tolerance of our list of wildlife species to various change agents.

Recent AMT guidance at and following Workshop 2 indicated that wildlife species CEs may be considered for inclusion throughout the Pre-Assessment phase. On one hand, this flexibility in considering various species may be appropriate until we know what kinds of data will be available to map and model various wildlife species. However, the Dynamac team feels constrained to retain the full list of

species selected using the Coppolillo screening because too many substitutions will invalidate the entire screening process requiring us to start again from the beginning. Any other species added to the list of conservation elements at this point can be considered *desired species*. Dynamac is also severely constrained by the need to proceed with Phase 3, methods and models, which requires that data layers have been identified and acquired. Any species added late will slow the process of mapping and modeling.

Biodiversity (Overview Memo 1)

The AMT indicated that Dynamac will receive G1 through G3 species occurrence data generalized to the level of the 5th level HUCs, one of the landscape reporting units specified in the REA Statement of Work. The intent is to present a generalized species-of-concern richness-summary map layer representing recorded G1 through G3 species occurrence data available from State Natural Heritage Programs. We have the option of subsetting these data in different ways to include biodiversity hotspots and endemics. These richness function map layers are limited in that they only represent locations from which occurrences have been recorded, rather than where the species currently occurs. In addition, there is a temporal element to consider, depending on the age of the records. The coarseness of the data generalization was required by BLM because of the prohibitive costs associated with acquiring spatially-explicit occurrence data as well as concerns about mapping detailed occurrence data for vulnerable species.

Conceptual Models (Section 3.2, Data Needs by Management Question Group)

The Dynamac team planned to approach the conceptual models with a strategy of increasing detail and documentation with each iteration of the Pre-Assessment from the broad scale basic ecoregion model to the detailed models that will accompany the modeling and mapping approaches in Task 3. The conceptual models developed for Task 2 are at an intermediate level of detail and resolution. The focus of this task was data and data acquisition; the conceptual models illustrate the mechanisms and relationships that assisted Dynamac staff in the data needs evaluation. To avoid duplication of effort, we planned that a full literature review would accompany the models to be developed for Task 3, Methods and Models. The conceptual models developed for Task 3 will be more detailed and specific to individual management questions pertaining to each conservation element. We view the phases in the Pre-Assessment as milestones and the memos as status reports. These products culminate in a workplan that will incorporate all of the elements.

The conceptual models used to date in the REA process are stressor models that illustrate the mechanisms and pathways of the sources of stress and the key, typical, or known responses of ecosystem attributes (conservation elements). Up and down arrows are commonly used to indicate the hypothesized response of particular ecosystem elements. If there are disagreements about the hypothesized responses of various elements, we will be happy to discuss them again when the models are fully developed, and we will retain and apply the review comments relative to various conceptual models during the next phase.

We did make a few changes to the conceptual models in response to specific comments following Workshop 2:

- A box indicating increased airborne dust was added to the soils conceptual model . Airborne dust means dust in quantities that affect air quality or carry plumes of eroded soil.
- We added *wildlife grazing* to the Ecological Systems conceptual model.

- We changed the orientation of the grazing and invasive species boxes in the invasive species conceptual model (Figure 9) and the fire conceptual model (Figure 8) to have the arrow run more directly from the grazing box to the introduction of invasive species box. We also added *insect kill* to the fire conceptual model.
- The Dynamac team agrees that it might be more useful to consolidate the grazing and forage management questions into the *Resource Use* category instead of having them split between *Resource Use* and *Soils*.

Coppolillo, P., H. Gomez, F. Maisels, and R. Wallace. 2004. Selection criteria for suites of landscape species as a basis for site-based conservation. *Biological Conservation* 115: 419–430.

I. INTRODUCTION

1.1 Overview of the REA Process

The purpose of the Colorado Plateau Rapid Ecological Assessment (REA) is to document the current status of selected ecological resources at the ecoregional scale and to investigate how this status may change in the future across several time horizons. REA assessments are expected to identify terrestrial and aquatic conservation areas, valued ecosystem functions and services, biological hotspots, and wildlife corridors. Terrain outside of the higher priority conservation areas may be deemed more suitable for development; a major outcome of the REA process then may be a reduction in conflict over prime, regionally-representative undeveloped landscapes and ecosystems. REAs are also timely in that they will initiate a planning process for management and mitigation of various climate change scenarios.

The Dynamac team will use existing data, modeling, and GIS analyses in an attempt to provide answers to a broad selection of management questions. The knowledge gained from these assessments and associated data compilation will provide the basis for future management planning across multiple spatial scales and jurisdictional boundaries. The ultimate value of the REAs lies in their ecoregion-wide application, which allows a seamless cooperative management approach between BLM, other federal and state agencies, non-governmental organizations, and citizen stakeholders. REAs will also identify knowledge gaps and create opportunities for future ecosystem monitoring and research.

II. DELIVERABLE OBJECTIVES

2.1 Overview of the Data Identification and Evaluation Step

The objective of the first REA task was to identify the subjects of focus and select a working set of management questions developed by the Assessment Management Team (AMT). In this second stage of the process, we conducted a data needs assessment and then located and identified extant data layers from a variety of sources for consideration. This report marks the beginning of an iterative data identification process that will continue through the Data Identification and Evaluation Workshop to the Work Plan Preparation stage. Additional data needs may arise as revisions are made to approaches and methods selected in Task 3.

2.2 Objectives

The objectives of Task I.1.2 are to identify, evaluate, and ultimately recommend datasets required to assess current status of a suite of ecological systems, species, sites, and ecological function and service conservation elements and to forecast changes in status at two future time horizons: 2025 and 2060. The conservation elements were identified and finalized during Task I.1.1. An additional objective of this task is to identify data gaps and to solicit suggestions from workshop participants.

2.3 Review of Memorandum I-1-c and Results of Workshop 1, August 2010

The objective of the first phase of the REA process was to identify the subjects of the assessment. The Dynamac team will estimate the current status and future condition of the ecoregion's natural resources by examining the relationships between a set of *conservation elements* and disturbance

factors or *change agents.* The REA Task Order defines core conservation elements as biotic constituents (wildlife and plant species and assemblages) or abiotic factors (e.g., soil stability) of regional significance in major ecosystems and habitats across the level III ecoregion. This limited suite of conservation elements is designed to represent all renewable resources and values within the ecoregion; as such, the individual conservation elements may serve as surrogates for ecological condition across the ecoregion. Through the individual or interactive effects of change agents, the condition of conservation elements may depart from a model of a minimally- or least-disturbed *reference condition* and thus depart from a state of ecological or biological integrity (Frey 1977, Karr and Dudley 1981).

The Dynamac team is committed to implementing a process that will assess the ecological condition of the selected conservation elements. Dynamac proposes using landscape condition estimates, including the condition of landscapes and habitats of a selected suite of species, as indicators of the condition of the ecoregion. These estimates will be based primarily on comparison of a predetermined reference condition with measures of direct anthropogenic disturbance and inferred qualitative levels of stress on the suite of species selected. During the assessment process, we will estimate qualitatively how far from a predetermined reference condition each conservation element has deviated and identify the change agents that contribute to the deviation from reference condition. This qualitative departure from reference condition will define a gradient of ecological condition at a relatively coarse scale—that of the ecoregion and the various landscape reporting units. Predictions of future changes in conservation element status will be approached in the same manner, using departures from a reference condition as a benchmark. The Dynamac team recommends that a more formal development of indicators of terrestrial ecological condition, using conservation elements known to be sensitive to particular change agents, be considered as a future sub-assessment or separate research topic.

2.3.1 REA Study Area and Landscape Reporting Units

The REA will be conducted within the boundaries of the Colorado Plateau ecoregion (Figure 1) and a buffer area consisting of 5th level hydrologic units. The purpose of the buffer is to help ensure agreement between mapped layers generated for REAs in neighboring regions and to avoid problems associated with "edge effects" during GIS analyses.

Assessment data will be summarized and displayed in landscape reporting units. Reporting units organize data into categories to reveal meaningful patterns. The resolution of the reporting units is fine enough to provide useful information yet coarse enough to avoid mapping at an inappropriately fine grain. In GIS analyses, it is important to recognize that the information content is only as good as the input data with the coarsest resolution. Summarizing information at a coarse resolution is one means to recognize this limitation, while at the same time providing a broad ecoregional perspective on the condition of resources of conservation significance.

Two landscape reporting units—30m pixels for raster data and 5th level hydrologic units—were identified in the REA Statement of Work (SOW). The Dynamac team suggested several other reporting units that were accepted by the AMT and the group at workshop 1 (August 9, 2010):

- *Omernik Level IV ecoregions, a finer resolution subdivision of the level III Colorado Plateau ecoregion.* There are strong regional differences between vegetation cover, resource capability, and vulnerability to change agents among these distinct geographic subregions (Omernik 1995).

- *Major aquifer boundaries*. Many of the aquatic resource management questions focus on potential changes in current and future groundwater extraction and recharge and the effects on conservation elements dependent on those resources.
- *A unit that represents the resolution of the 15 km climate data that will be used in the REA.* The rationale for using a reporting unit at this resolution is that in any geospatial analyses the information content is limited by the coarsest resolution of the data, in this case, the climate data.

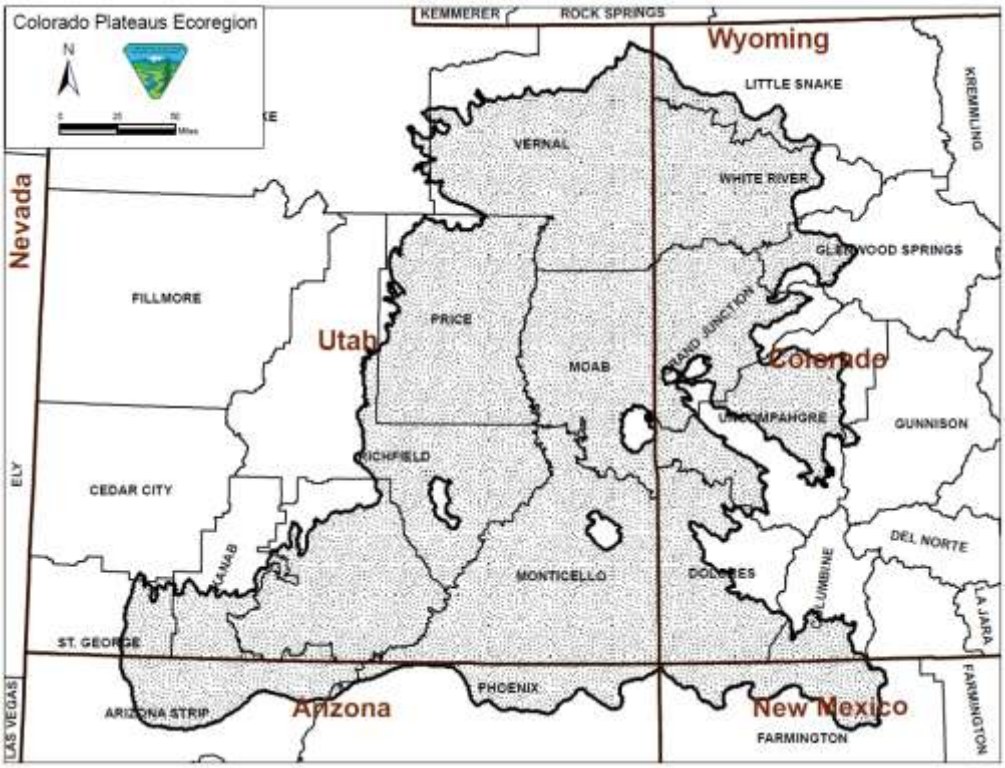

Figure 1. Extent of the Colorado Plateau Ecoregion (shaded).

2.3.2 Ecoregional Conceptual Model

The purpose of the REA is to assess factors that may affect, both positively and negatively, the current and future condition of resources of conservation concern. The reference condition of these resources or conservation elements is dependent on direct and indirect effects associated with natural disturbances or change agents, such as cycles of fire, drought, pests, and pathogens. Human disturbances and stresses associated simply with proximity to human activities all impinge upon the condition of these resources. Conceptual models can be helpful to visualize the tangled mechanisms and pathways of change (Figure 2). They are also helpful in defining relationships between conservation elements, threats, and associated change agents that can form the basis for the development of management questions and the selection of associated data layers.

In the basic ecoregional conceptual model for the Colorado Plateau (Figure 2), boxes represent conservation elements, ovals represent classes of change agents, and arrows represent the direct and indirect effects (threats, stresses, or positive change) on ecosystem components, including conservation elements. The conceptual model portrays the ecoregion under natural conditions representing ecological integrity and under the influence of anthropogenic stressors (represented by red arrows) and associated change agents. The present model lacks some spatial or temporal components that will be developed later in more detailed models.

Regional climatic conditions represent the dominant natural change agent in the basic ecoregion conceptual model (Figure 2). Secondary natural regional change agents in the Colorado Plateau include the natural fire regime and cyclical drought. Natural change agent classes are depicted as orange ovals in the conceptual model. Across the ecoregion, variability in geology, physiography, elevation, aspect, ground and surface water availability, and soil (texture, depth, and water-holding capacity) is reflected in patterns of vegetative cover. Black arrows in the model depict the major interactions between natural abiotic and biotic components. The overlay of human activities, expressed as anthropogenic change agents and change agent subclasses, are shown as yellow ovals on the conceptual model. The oval marked *land and resource use* covers major human activities such as urban and industrial development, surface and groundwater extraction, recreation, and grazing. The red arrows mark the interactions of human activities with other model components.

Four representative natural vegetation coarse-filter classes—arid basin shrublands, semi-arid sage, riparian communities, and upland pinyon-juniper woodland— are centrally located in the ecoregion conceptual model. The boxes for vegetation classes are depicted in the conceptual model according to elevational and moisture differences; they represent various combinations of the coarse filter conservation element classes covering more than 1 or 2% of the ecoregion area (although every vegetation class listed as an Ecological System in the Southwest Regional Gap Analysis Project (SW ReGAP, Prior-Magee et al. 2007) is included in the coarse-filter selection of conservation elements). Though biological (cryptogamic) soil crusts might logically fall into several of the coarse filter vegetation classes, we chose to picture soil crust separately in the conceptual model to highlight its importance and to note our proposal to add soil crusts as a conservation element. Soil crusts serve as intermediaries between soil and vegetation, with important stabilization and nitrogen-fixing roles to play (Belnap and Gillette 1998, Belnap 2002, Housman et al. 2006). Wildlife occurrence and abundance is dependent on interactions with all the abiotic factors (such as climate, fire regime, and water availability) and the vegetation classes (representing major habitats).

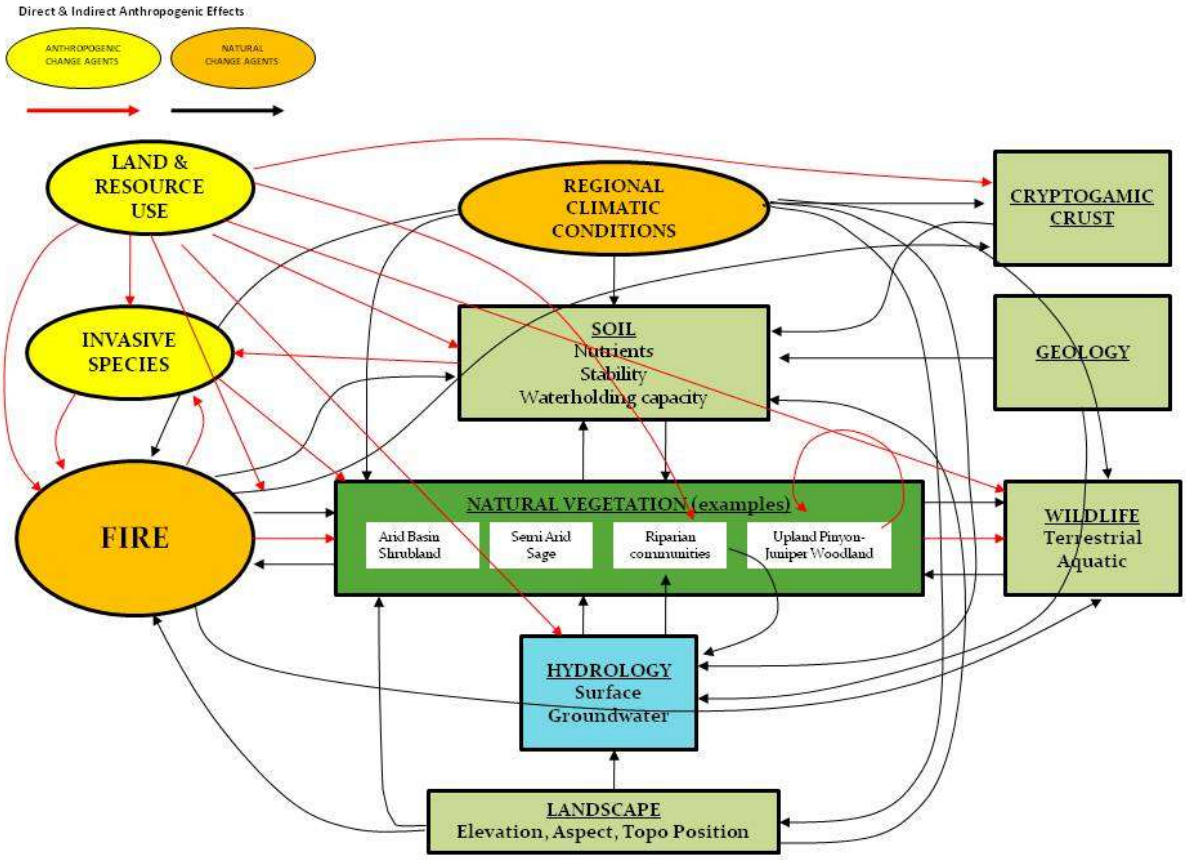

Figure 2. Generalized ecoregion conceptual model for the Colorado Plateau Ecoregion, with both natural and anthropogenic change agents shown (yellow ovals represent anthropogenic change agents; orange ovals represent natural change agents) and associated direct and indirect threats (red arrows represent anthropogenic threats) on ecosystem components.

The basic ecoregion conceptual model serves as the source for more detailed conceptual sub-models that will accompany subsequent modeling and assessments. For example, the sub-model for Forest and Woodland Class/pinyon-juniper woodland will show additional detail in interactions between human influences such as land treatments, pinyon-juniper removal, and grazing, and the effects on the vegetation community and surrounding landscape with changes in fire regime, introduction of non-native annuals, increased soil erosion, runoff, and stream incision.

2.3.3 Management Questions

The AMT provided a list of core management questions in the SOW to guide the assessment process. Part of the challenge of this first REA was to gauge the time and resource requirements needed to address the full complement of management questions in a manner that would have utility for BLM

for future planning purposes. The Dynamac team evaluated each question to determine whether they could be feasibly answered during the short timeframe of the REA. Management questions fell into two general categories. The first category included what/where questions that could be answered with simple data compilation and summaries. We expect that many of these what/where questions may have been answered in earlier studies and will be readily available. A second category of management questions appeared to require considerable analytical processing as well as data compilation. For these questions, we either recommended that the question be addressed in future research or we suggested a rewording of the question that was within the scope of the REA. We also identified additional management questions for consideration by the AMT.

We examined each question and determined the type of data required and the probable approaches and methods that could be used. Management questions were then rated based on these approaches as routine GIS summaries, involved analyses, complex/costly/time consuming analyses, or basic research–beyond scope. It was our intent to address each management question in some manner, if feasible, particularly if the nature of the output would have some utility for BLM and agency partners. We received helpful guidance from BLM regarding the expected level of effort and the nature of some types of analyses. Following review by Workshop participants, USGS peer review, and AMT review, we received a finalized set of management questions. In the second REA task, described in the present Memo, the management questions are linked to data needs and available data layers (Appendix 10).

2.3.4 Conservation Elements

REAs are intended to characterize the current status (baseline conditions) and forecast the future condition of ecological resources in each ecoregion. This process requires identification of a set of conservation elements that represent the general condition of the full array of resources of conservation concern within the region. The REA Task Order defines core conservation elements as biotic constituents (wildlife and plant species and assemblages) or abiotic factors (e.g., soil stability) of regional significance in major ecosystems and habitats across the level III ecoregion.

The initial selection of species created considerable debate at the first Workshop. The debate centered on the selection process itself, the rationale for inclusion of vulnerable species, and the mixing of vulnerable species and species managed for game. Following Workshop 1, the AMT recommended alternate approaches to conservation element definition and selection. They suggested that conservation elements include Ecological Systems (vegetation communities) as coarse filters, sensitive species as a richness function (presented in this section as species diversity hotspots under the category of sites of terrestrial conservation concern), a selection of plant species as fine filters, a selection of up to a dozen landscape wildlife species, and a set of desired species (the initial list of species of concern presented in the SOW) identified by the AMT. In addition, a range of terrestrial and aquatic sites and ecological services and functions (such as soil stability) were considered for inclusion as conservation elements.

2.3.4.1 Coarse-Filter Conservation Elements

The REA approach outlined in the SOW specifies the use of the coarse filter/fine filter approach. Coarse filter conservation elements represent characteristic vegetation assemblages occurring within the ecoregion. For this REA, the Dynamac team chose to use the vegetation types defined in the SW ReGAP project (Prior-Magee et al. 2007). These classes provide the foundation for both the fine-filter plant species and wildlife landscape species conservation elements. We elected to include all Ecological Systems present in the ecoregion to serve as coarse filters, rather than solely those

occupying a large fraction of the landscape, since some of the smaller vegetation classes have importance as habitat disproportionate to their area (Appendix 1). We also included the Ecological Systems occurring in the isolated mountainous inclusions within the ecoregion (such as the La Sal Mountains), since some of the landscape species present in the ecoregion use these higher elevation areas.

Dynamac proposed that the AMT add an additional conservation element that provides critical ecosystem functionality in arid regions, cryptogamic or biological soil crusts. This important component of these ecosystems serves to protect soil from wind and water erosion, fix nitrogen, and inhibit the invasion of exotic plants (Belnap and Gillette 1998, Housman et al. 2006, Bowker et al. 2008). It is also highly vulnerable to disturbance, both local and severe, as from OHV use (Belnap 2002), and broad and extensive, accompanying the grazing of livestock in these ecosystems. Loss of these crusts can be viewed as a subtle, yet profound stress on these systems. The products from this component of the assessment might be very useful to help predict invasibility of extant natural plant communities by exotic annuals, for example. In addition, they could be a useful indicator of arid ecoregion condition. The decision after Workshop 1 was to include biological soil crusts as a conservation element until data sources and methods have been explored in Workshops 2 and 3.

2.3.4.2 Fine-Filter Plant Species Conservation Elements

The species richness for special status species will capture fine-filter special status species by 5th level watershed (see Biodiversity, page 2). Also, several species CEs have conservation status and are fine-filters. In addition, because no plant species were identified as conservation elements and because of the interest in climate change modeling, Dynamac was directed by the AMT to identify a dominant plant species associated with each of the principle Ecological Systems in the Colorado Plateau. Dynamac will characterize their current distribution and vulnerability to change agents, including predicted vulnerability associated with climate change. To select the plant species, we identified dominant overstory species and selected a single species from each Ecological System. Eight species represent 66.5% of the landscape in the Colorado Plateau ecoregion (Appendix 2).

2.3.4.3 Landscape Species Conservation Elements

Landscape species are defined as those wildlife species that inhabit large, ecologically diverse areas; they may also influence the ecosystems that they use (Sanderson et al. 2002, Coppolillo et al. 2004). Landscape species habitat requirements may make them vulnerable to human activity and alteration of the landscape. Criteria for landscape species selection include habitat use heterogeneity, large area requirements, vulnerability to anthropogenic disturbance or threats associated with change agents, functional contributions to the ecological system, and relative socio-economic importance (Coppolillo *et al*. 2004). Species are ranked in descending order of aggregate scores for each of these attributes and selected based on both aggregate score and the ecological systems they use. Each subsequent species is selected on the basis of score and minimum overlap in ecological systems used, until all ecological systems are accounted for. A cross check is then made to ensure that all change agent threats are accounted for as well. Four to six species are expected to be selected from an original, somewhat arbitrary, selection of 10 to 25 candidate species. The AMT requested that we include the core desired species that they had identified in the initial SOW in the list of candidate species to be screened as landscape species. The Dynamac team used the basic structure of the Coppolillo approach and redefined some of the component scoring procedures (see Appendix 3 for scoring criteria). We then selected a set of 25–30 species from the State Wildlife Action Plan lists and the SW ReGAP list, as well as the core species identified in the SOW by the AMT, and proceeded to score each species.

We used this approach to screen a selection of candidate species (Appendix 4) and select a final suite of landscape species (Appendix 5).

2.3.4.4 Desired Species as Conservation Elements

Those core species identified by the AMT in the Statement of Work for this REA that failed to score high enough in the landscape species screening were reserved as *desired species conservation elements* for use in separate assessments (Appendix 6). For the Colorado Plateau, we will also treat wild horses and burros as desired conservation elements. These elements will be treated and reported on separately in the REA final report summaries.

2.3.4.5 Sites of Conservation Concern

Terrestrial and aquatic sites of conservation concern represent a particular challenge for management planning. It is possible that some sites may lose the function for which they were designated as a result of interactions between climate change and other change agents. All of the terrestrial and aquatic sites of conservation concern initially proposed by the AMT were accepted at Workshop 1 (Appendix 7). Dynamac will assess current and forecasted threats to the sites of conservation concern from a range of change agents.

The Dynamac team suggested that the AMT consider adding an additional biodiversity indicator to be covered under sites of conservation concern. We proposed that we summarize all available location data of species of concern (Federally Listed T, E, candidate species, and State Ranked G1 – G3 species) in a several ways: 1) by occurrence at the 5th level HUC landscape reporting unit, 2) within a coarse grid with a resolution of 50x50 km, and 3) by level IV ecoregion. Species must occur in at least 5% of the ecoregion. The AMT and the group at Workshop 1 accepted this additional biodiversity conservation element and recommended that we complete one or two CEs (plant and animal) for this modeling exercise.

The Dynamac team also proposed the inclusion of reference sites identified in the Environmental Protection Agency's EMAP-West stream survey (conducted 2000–2004). These sites, representing discrete stream reaches and their upstream catchments, were identified in a probabilistic sampling of all streams in 12 western states (Stoddard et al. 2005). Least-disturbed sites sampled were selected on the basis of watershed-level disturbance and in-stream conditions identified during field reconnaissance & sampling (Lattin et al. In Review). These sites, along with highly disturbed sites, were used to develop and calibrate indicators of biological integrity and expectations of least-disturbed condition within the waters of each ecoregion. The least-disturbed sites represent ecoregion-level reference conditions, which have intrinsic value as both aquatic and terrestrial conservation elements. We will qualitatively rank the sampled watersheds according to the indicators of biological integrity associated with the sampled reach. The AMT and workshop participants accepted Dynamac's suggestion to add the EPA reference site database to the list of aquatic sites of conservation concern.

2.3.4.6 Ecosystem Functions and Services as Conservation Elements

Ecological functions and services of conservation concern include surface and ground waters and riparian zones (Appendix 8). Soil stability was suggested as an additional terrestrial function at the first workshop. Forage was recommended by the AMT and added as a conservation element associated with livestock grazing.

2.3.5 Change Agents

Assessment of the status of conservation elements must be conducted with reference to both natural and anthropogenic disturbance factors. The concept of reference condition subsumes natural disturbance dynamics and the full range of potential natural successional trajectories and states. Deviation from the range of natural states characterizing reference condition is due to direct or indirect disturbances of anthropogenic origin (Hughes *et al*. 1986, Hughes 1995). These disturbances represent the change agents of interest in the REA process, although the same change agent may represent a threat to one organism and a benefit to another. The Dynamac team accepted the change agents identified by the AMT as clearly important to ecological resources at the ecoregional scale, and we suggested an additional change agent, grazing, for AMT consideration (Appendix 9). After group discussion at the first workshop and subsequent AMT direction, grazing was accepted as a change agent if it included grazing by all herbivores, i.e., wildlife, wild horses and burros, and livestock.

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III. DATA NEEDS ASSESSMENT

3.1 Overview

To identify general data needs to address specific management questions, the Dynamac team grouped management questions into subject classes and, using a conceptual model of conservation elements, change agents, and influential processes as a guide, we identified data layers needed to address each question within the group (Figure 3). This grouping proved useful not only for the data needs assessment, but later in data gap identification as well.

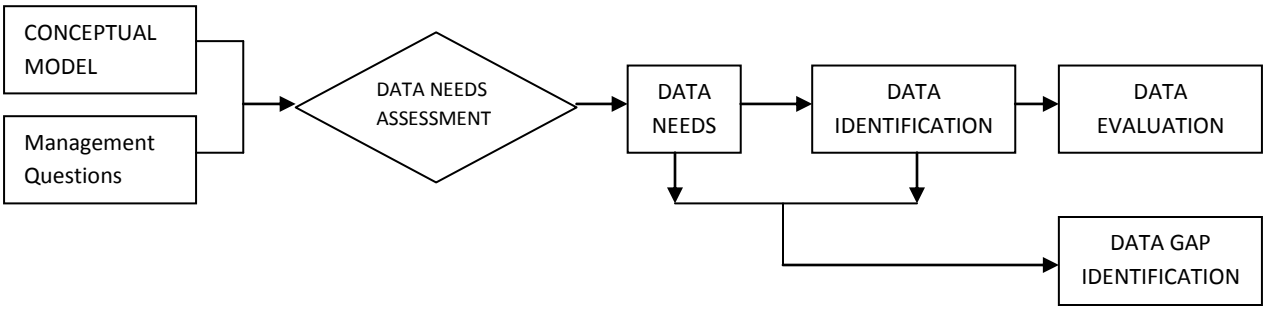

Figure (3). Process of data needs assessment through data evaluation and gap identification.

Identification of the data needs related to groups of management questions first required consideration of the general approaches, methods, and tools by which each question might be answered. At this stage it is premature to assume that any particular approach or method will be approved, since decisions on approaches will not be made until the conclusion of Task 1.3. However, some assumptions had to be made to focus our data needs assessments. In general, the approaches will take the form of assessments of status or of potential for change, depending on the nature of the question and the availability of the data. We are using the definition of status as outlined in the Statement of Work (SOW):" …current status is the existing state or cumulative condition that has resulted from all past changes imposed upon the prior historical condition. Status is characterized by attributes and indicators for size, condition, landscape context, and trend." Describing status for various conservation elements and resource values assumes that specific characteristics of a resource can be specifically identified and mapped. Potential for change describes how status may change in the future. As stated in the SOW, potential for change is characterized by attributes and indicators for direction, magnitude, likelihood, and certainty of change. For example, to estimate the vulnerability of biological soil crust to disturbance, we must predict the relative likelihood of resource distribution resilience and the likelihood of exposure to mechanical disturbance. Potential impacts of development or climate change on wildlife habitat suitability will also take the form of potential to change assessments.

There are additional characteristics of the data that influence the output and the nature of the answers to specific management questions. Current status can be defined in spatially explicit terms. The footprint of oil and gas wells, the network of service roads, or locations of habitat corridors can be accurately described. Many questions related to future condition or potential for change lack this spatial specificity. Oil, gas, and renewable energy lease areas, or areas identified as having high

potential for future development are simply zones in which measurable footprints, or even approximate locations, cannot be determined. Nor, for example, can we predict patterns of connectivity of vegetation under a climate change scenario and a change in disturbance frequency and severity. Logical areas may be set aside in which to preserve connectivity, but actual spatial configurations, patch size frequency distributions, and inter-patch distances can only be estimated. Successful comparison of current with future forecast conditions require output products that can be directly compared. This will present a challenge in addressing some of the management questions in this REA. These issues were also considered as we sought data to address specific needs.

3.2 Data Needs by Management Question Group

Management questions were reorganized into groups for data needs evaluation and gap assessments. Each management question was reviewed and a tentative approach identified to provide a rationale for the data needs assessment. The rationale and data needs assessment by management question are summarized in Appendix 10. For convenience, we organized the tentative data needs by the management question groups. The data needs assessments organized by management question groupings are listed in the tables below (Tables 1–10), each accompanied by a conceptual model (Figures 4–10, 12–13) used to assist in data needs review.

The conceptual models developed for Task 2 are at an intermediate level of detail and resolution. The focus of this task was data and data acquisition; the conceptual models illustrate the mechanisms and relationships that assisted Dynamac staff in the data needs evaluation. To avoid duplication of effort, we planned that a full literature review would accompany the models to be developed for Task 3, Methods and Models. The conceptual models developed for Task 3 will be more detailed and specific to individual management questions pertaining to each conservation element. We view the phases in the Pre-Assessment as milestones and the memos as status reports. These products culminate in a workplan that will incorporate all of the elements.

The conceptual models used to date in the REA process are stressor models that illustrate the mechanisms and pathways of the sources of stress and the key, typical, or known responses of ecosystem attributes (conservation elements). Up and down arrows are commonly used to indicate the hypothesized response of particular ecosystem elements.

CONCEPTUAL MODEL FOR MANAGEMENT QUESTIONS RELATED TO SOILS OR SOIL STABILITY

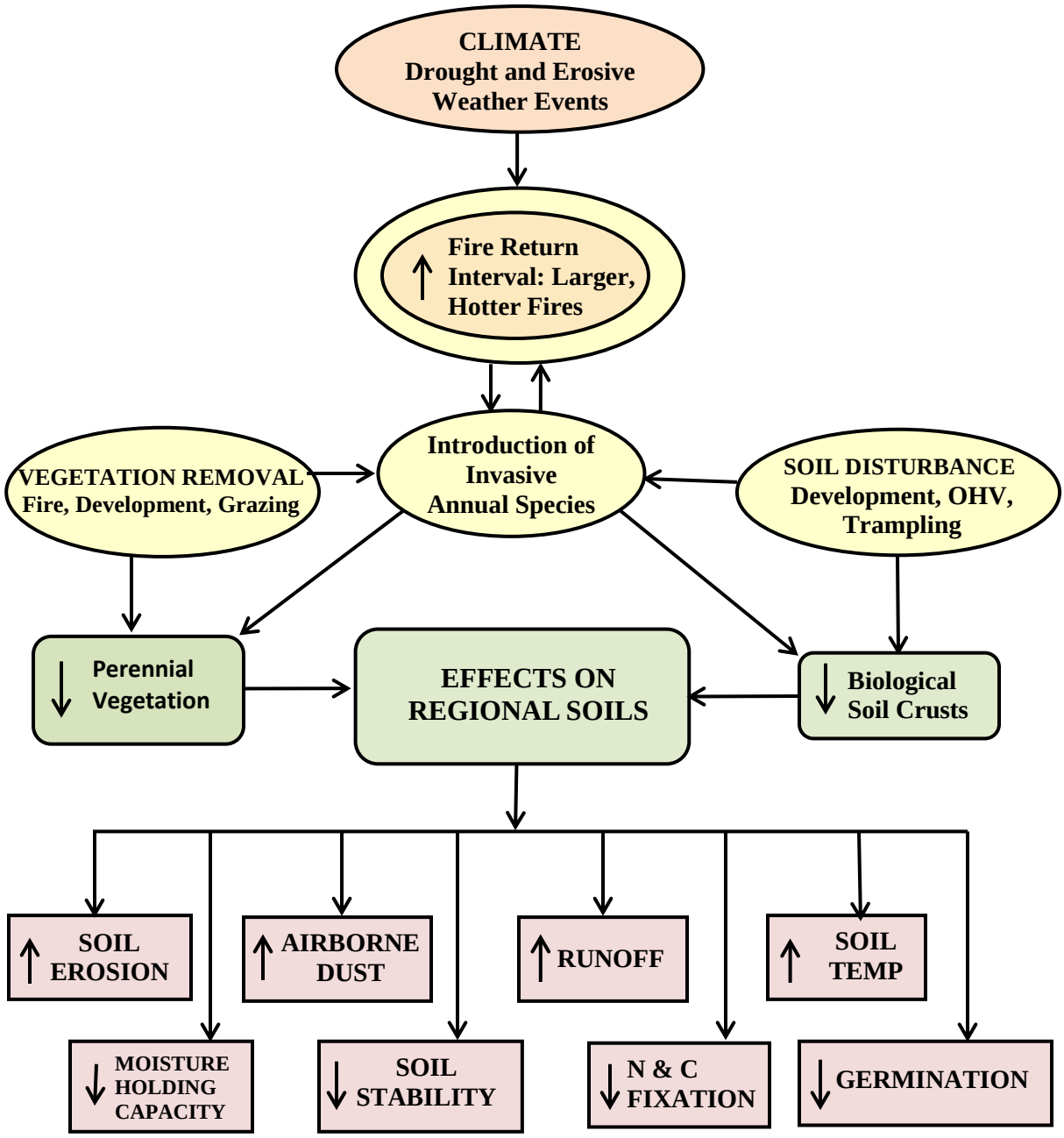

Figure 4. The conceptual model used to assist in the data needs assessment for management questions related to soils and cryptogamic crusts.

Table 1. Tentative DATA NEEDS associated with management questions related to SOILS, BIOLOGICAL CRUSTS, and FORAGE as conservation elements.

SOILS. BIOLOGICAL CRUSTS, FORAGE MANAGEMENT QUESTIONS

- Where are soils susceptible to wind and water erosion?
- Where are soils with the potential to change from high wind erosion/dust/dunes likely to develop due to climate change or groundwater withdrawal?
- Where are sensitive (saline) soils?
- Where are the areas of important forage production for livestock, wild horses and burros, and wildlife located?
- What is the potential for future change to forage production from change agents?
- Where are soils that have or have potential to have cryptogamic soil crusts?
- Where are these intact cryptogamic crusts located?
- What/where is the potential for future change to the cryptogamic crusts?
- Where are areas producing fugitive dust that may contribute to accelerated snow melt in the Colorado Plateau?

TENTATIVE DATA NEEDS	DATA CLASS
Ownership	ADMINSITRATIVE
PRISM	CLIMATE
DAYMET	CLIMATE
Future Climate Change Scenario	CLIMATE
Winds	CLIMATE
Human footprint variables (including areas of probable future energy development)	DEVELOPMENT
Unimproved roads layer	DEVELOPMENT
Planned development layers (2025)	DEVELOPMENT
Grazing Allotments	GRAZING
Herd Areas (HAs)	GRAZING
Herd Management Areas (HMAs)	GRAZING
Ranches & farms	GRAZING
Agricultural census data	GRAZING
AU densities	GRAZING
Modeled wild horse habitat usage	GRAZING
Modeled burro habitat usage	GRAZING
Groundwater Extraction Areas	GROUNDWATER
Modeled wildlife habitats	HABITAT

Table 1. (Continued)

SOILS. BIOLOGICAL CRUSTS, FORAGE MANAGEMENT QUESTIONS

- Where are soils susceptible to wind and water erosion?
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- What/where is the potential for future change to the cryptogamic crusts?
- Where are areas producing fugitive dust that may contribute to accelerated snow melt in the Colorado Plateau?

TENTATIVE DATA NEEDS	DATA CLASS
Mapped distribution of non-native plants of forage value	INVASIVES
Risk of invasive species	INVASIVES
OHV use areas and vulnerable areas	RESOURCE USE
PFC data if available	RIPARIAN CONDITION
STATSGO	SOILS
SSURGO	SOILS
Sensitive Soils layer	SOILS
Surficial geology	SOILS/GEOLOGY
Sampled soil crust location data (Bowker et al. 2008)	SOILS
NHD	SURFACE WATER
All other available surface water sources including wildlife and stock tanks and guzzlers	SURFACE WATER
DEM (NED)	TOPOGRAPHY
Rangeland Condition Assessments if available	UPLAND CONDITION
LANDFIRE EVT	VEGETATION
LANDFIRE BpS	VEGETATION
LANDFIRE Canopy Closure	VEGETATION
Forage availability (multi-date MODIS EVI)	VEGETATION
Water quality status	WATER QUALITY
Fire risk	WILDFIRE

CONCEPTUAL MODEL FOR MANAGEMENT QUESTIONS RELATED TO AQUATIC RESOURCES

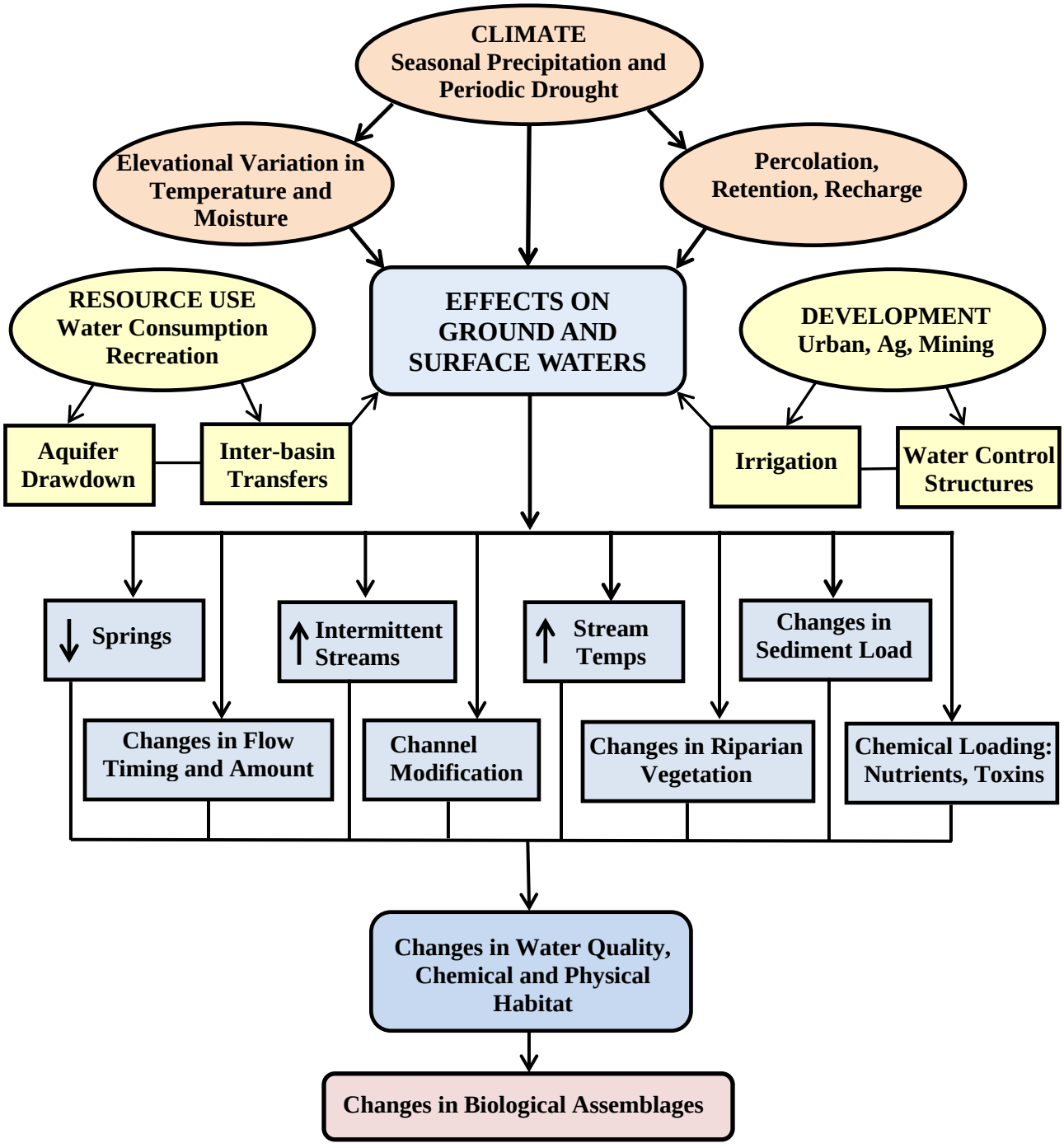


Figure 5. The conceptual model used to assist in conducting the data needs assessment for management questions related to surface and groundwater status.

Table 2. Tentative DATA NEEDS associated with management questions related to SURFACE and GROUNDWATER as conservation elements.

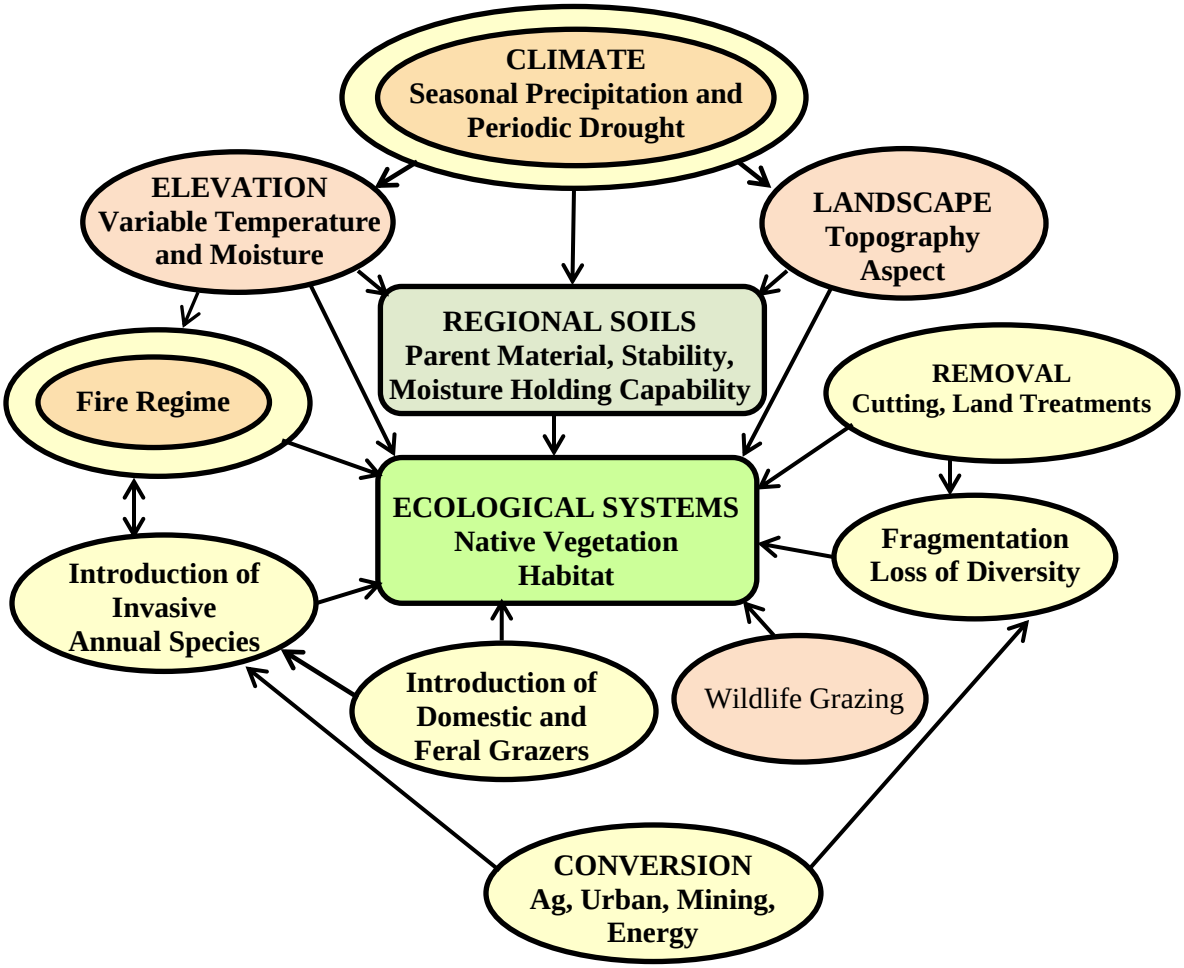
SURFACE AND GROUNDWATER MANAGEMENT QUESTIONS

- Where are the surface waterbodies and livestock and wildlife watering tanks?
- What is the persistence of the flow (e.g., perennial, ephemeral) of these systems?
- Which surface waters are likely dependent on seasonal precipitation, and what are the characteristics of their current seasonal flows?
- Where are the aquifers and their recharge areas?
- Which surface waters are likely dependent on groundwater to maintain their ecological condition?
- What is the condition of these various aquatic systems defined by PFC?
- Where are the degraded aquatic systems (e.g., water quality)?
- What is the location/distribution of these (aquatic) sites?
- What/Where is the potential for future change to these (aquatic) high biodiversity sites in the near-term, 2025 (development), and long-term, 2060 (climate change)?
- Where are the areas of high and low groundwater potential?
- Where are the areas showing effects from existing groundwater extraction?
- Where are artificial water bodies, including evaporation ponds, etc.?

TENTATIVE DATA NEED	DATA CLASS
DAYMET	CLIMATE - CURRENT
PRISM	CLIMATE - CURRENT
Future climate data (2060 climate change scenario data)	CLIMATE - FUTURE
Aquifer locations	GROUND WATER
Monitored deep well locations and longitudinal flow data	GROUND WATER
Ground water extraction areas	GROUND WATER
Wild and Scenic Rivers	SITES OF CONSERVATION CONCERN
Aquatic sites of conservation concern	SITES OF CONSERVATION CONCERN
Surficial geology,	SOILS/GEOLOGY
STATSGO	SOILS/GEOLOGY
SSURGO	SOILS/GEOLOGY
EO's of Aquatics	SPECIES CONSERVATION ELEMENTS
NHD	SURFACE WATER
Guzzler Locations if available	SURFACE WATER
EMAP-West field data stream flow status observations	SURFACE WATER
Stream gage data	SURFACE WATER
NWI	SURFACE WATER
Watershed boundaries	SURFACE WATER

Table 2. (Continued)

SURFACE AND GROUNDWATER MANAGEMENT QUESTIONS	
• Where are the surface waterbodies and livestock and wildlife watering tanks? • What is the persistence of the flow (e.g., perennial, ephemeral) of these systems? • Which surface waters are likely dependent on seasonal precipitation, and what are the characteristics of their current seasonal flows? • Where are the aquifers and their recharge areas? • Which surface waters are likely dependent on groundwater to maintain their ecological condition? • What is the condition of these various aquatic systems defined by PFC? • Where are the degraded aquatic systems (e.g., water quality)? • What is the location/distribution of these(aquatic) sites? • What/Where is the potential for future change to these (aquatic) high biodiversity sites in the near-term, 2025 (development), and long-term, 2060 (climate change)? • Where are the areas of high and low groundwater potential? • Where are the areas showing effects from existing groundwater extraction? • Where are artificial water bodies, including evaporation ponds, etc.?	
TENTATIVE DATA NEED	**DATA CLASS**
Spring locations	SURFACE WATER
Bureau of Reclamation flow change projection data	SURFACE WATER
Artificial water bodies	SURFACE WATER
DEM (NED)	TOPOGRAPHY
LANDFIRE BpS & EVT	VEGETATION
303 (d) streams	WATER QUALITY
TMDLs	WATER QUALITY
NLCD	WATERSHED DISTURBANCE
TIGER roads	WATERSHED DISTURBANCE
RUSLE Metric layer (EMAP-WEST)	WATERSHED DISTURBANCE
Other EMAP-WEST Landscape Condition Metrics	WATERSHED DISTURBANCE
Current land cover and human footprint layers	WATERSHED DISTURBANCE
Areas of planned or projected growth and development (including dam construction)	WATERSHED DISTURBANCE

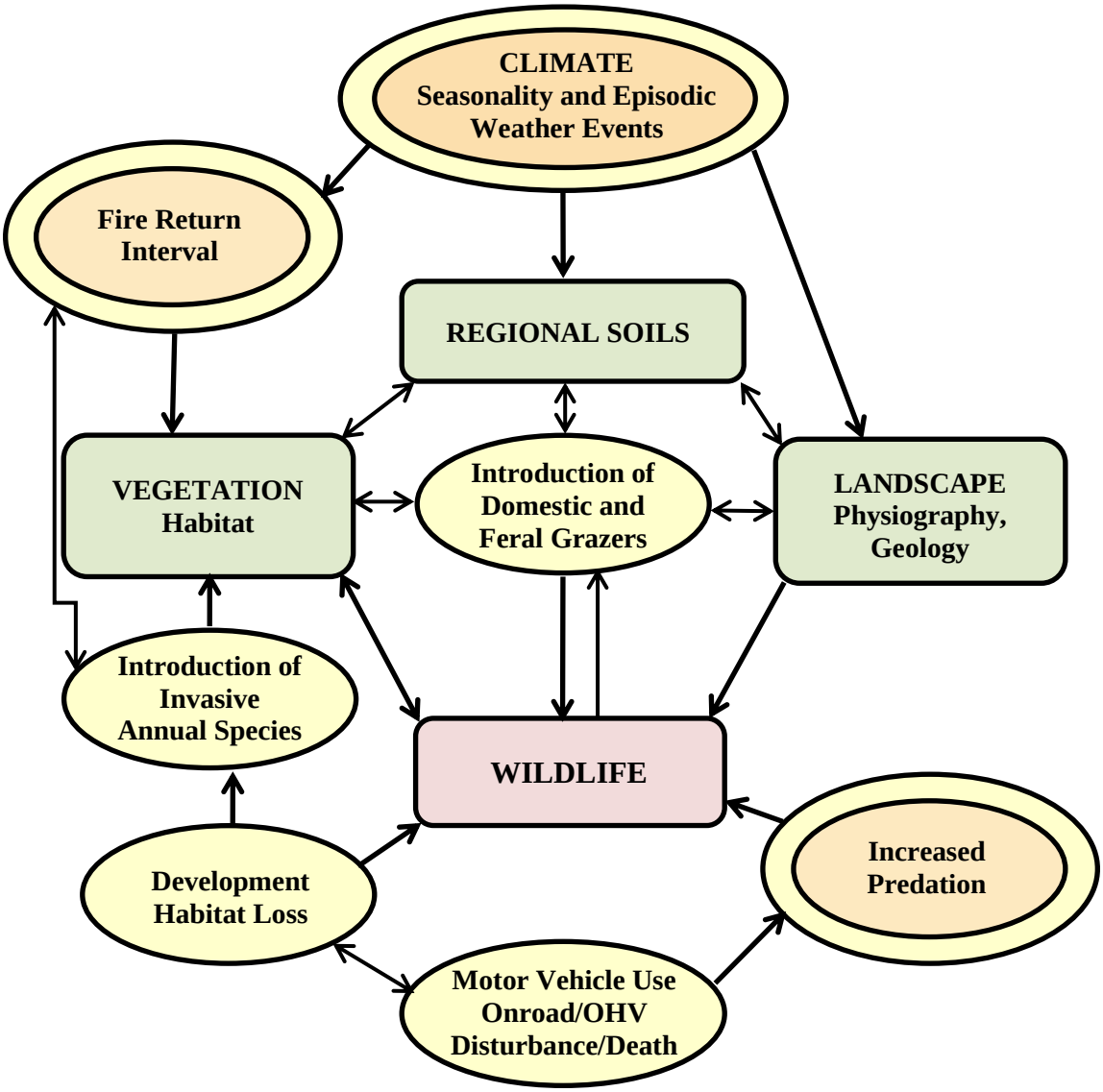


CONCEPTUAL MODEL FOR MANAGEMENT QUESTIONS RELATED TO ECOLOGICAL SYSTEMS

Figure 6. The conceptual model used to assist in conducting the data needs assessment for management questions related to Ecological Systems.

Table 3. Tentative DATA NEEDS associated with management questions related to ECOLOGICAL SYSTEMS as conservation elements.

ECOLOGICAL SYSTEM MANAGEMENT QUESTIONS	
• Where are these intact vegetative communities located? • What/where is the potential for future change to the community?	
TENTATIVE DATA NEEDS	**DATA CLASS**
Current climate bioclimatic variables - PRISM or DAYMET	CLIMATE - CURRENT
Bioclimatic variables derived - 2060 climate scenario data	CLIMATE - FUTURE
Mapped Conservation/Reserve Program areas.	CRP AREAS
TIGER	HUMAN FOOTPRINT
ESRI Roads	HUMAN FOOTPRINT
NLCD	LANDCOVER/LAND USE
Distribution of a dominant, characteristic plant species representative of the Ecological System	PLANT SPECIES OCCURRENCE DATA
STATSGO	SOILS/GEOLOGY
SSURGO,	SOILS/GEOLOGY
Surficial geology	SOILS/GEOLOGY
DEM (NED)	TOPOGRAPHY/ELEVATION
LANDFIRE (EVT, Canopy Closure, Potential Vegetation)	VEGETATION



CONCEPTUAL MODEL FOR MANAGEMENT QUESTIONS
RELATED TO WILDLIFE SPECIES CONSERVATION ELEMENTS
Adapted from Kotliar et al. 2008

Figure 7. The conceptual model used to assist in conducting the data needs assessment for management questions related to species conservation elements.

Kotliar, N.B., Bowen, Z.H., Ouren, D.S., and Farmer, A.H. 2008. A regional approach to wildlife monitoring related to energy exploration and development in Colorado: U.S. Geological Survey Open-File Report 2008–1024, 66 p.

Table 4. Tentative DATA NEEDS associated with management questions related to SPECIES, habitats, and sites of high biodiversity or of conservation concern as conservation elements.

SPECIES CONSERVATION ELEMENTS MANAGEMENT QUESTIONS

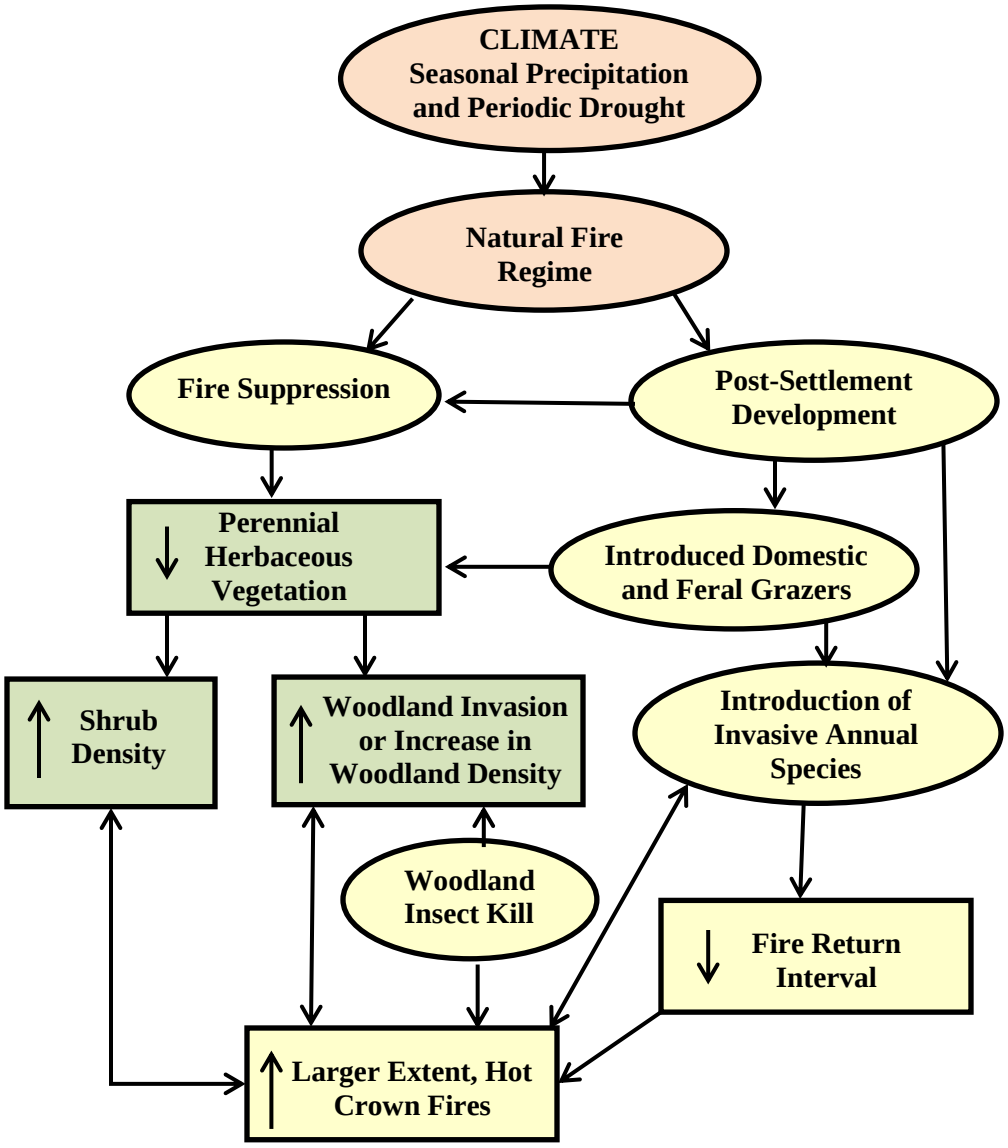
- What is the current distribution of occupied habitat, including seasonal habitat, and movement corridors?
- What areas known to have been surveyed and what areas have not been surveyed (i.e., data gap locations)?
- Where are change agents affecting these habitat and movement corridors?
- Where are habitats that may be limiting species sustainability?
- Where are species populations at risk?
- Where are potential habitat restoration areas?
- Where are potential areas to restore connectivity?
- What is the location/distribution of these (terrestrial) sites?
- What/where is the potential for future change to these high-biodiversity sites in the near-term horizon, 2025 (development) and a long-term change horizon, 2060 (climate change)?
- Where are the current wild horse and burro populations?
- What/where is the potential for future change to this species in the near-term horizon, 2025 (development) and a long-term horizon, 2060 (climate change)?
- Where are the areas of core conservation aquatic species habitat change?
- Where are the (Conservation/Reserve Program) areas?

TENTATIVE DATA NEEDS	DATA CLASS
Atmospheric Deposition	AIRBORNE POLLUTANTS
USEPAs EMAP-West indicators of stream condition data and landscape disturbance data, Forest Fragmentation	AQUATIC CONDITION
Current climate (PRISM, DAYMET)	CLIMATE - CURRENT
Future climate (2060 downscaled climate model)	CLIMATE - FUTURE
Drought	CLIMATE - RECENT
Human footprint (Development)	DEVELOPMENT
Road Density	DEVELOPMENT
Land use planning areas	DEVELOPMENT - FUTURE
Population growth projections	DEVELOPMENT - FUTURE
LANDFIRE (EVT, Canopy Closure, Potential Vegetation)	HABITAT
Identified movement corridors	HABITAT
Identified seasonal habitats	HABITAT
Active and Abandoned Mines.	HABITAT
Forest Insect and Diseases	INSECTS/DISEASE
Invasive species distribution & vulnerability	INVASIVE SPECIES
NLCD	LANDCOVER/LAND USE
Human Footprint layers, including dam locations & water diversions	LANDCOVER/LAND USE
USEPAs EMAP-West landscape metric layers	LANDSCAPE CONDITION
HUC boundary file, various site lists identified in Memorandum I.1.c	LANDSCAPE REPORTING UNITS
Grazing pressure	RESOURCE USE

Table 4. (Continued)

SPECIES CONSERVATION ELEMENTS MANAGEMENT QUESTIONS
• What is the current distribution of occupied habitat, including seasonal habitat, and movement corridors? • What areas known to have been surveyed and what areas have not been surveyed (i.e., data gap locations)? • Where are change agents affecting these habitat and movement corridors? • Where are habitats that may be limiting species sustainability? • Where are species populations at risk? • Where are potential habitat restoration areas? • Where are potential areas to restore connectivity? • What is the location/distribution of these (terrestrial) sites? • What/where is the potential for future change to these high-biodiversity sites in the near-term horizon, 2020 (development) and a long-term change horizon, 2060 (climate change)? • Where are the current wild horse and burro populations? • What/where is the potential for future change to this species in the near-term horizon, 2020 (development) and a long-term horizon, 2060 (climate change)? • Where are the areas of core conservation aquatic species habitat change? • Where are the (Conservation/Reserve Program) areas?

TENTATIVE DATA NEEDS	**DATA CLASS**
Forest Management (Logging, control fire)	RESOURCE USE
STATSGO	SOILS
Biological Significance Ranking (NHP) for species conservation elements.	SPECIES - ANCILLARY
Herd Areas (HA) data layer	SPECIES CONSERVATION ELEMENT
Herd Management (HMA) data layer	SPECIES CONSERVATION ELEMENT
Wild horse and burro population data	SPECIES CONSERVATION ELEMENT
Aquatic species occurrence data (event data for NHD	SPECIES CONSERVATION ELEMENT
NHP EO's	SPECIES OCCURRENCES
NHD	SURFACE WATER
Spring, Seeps	SURFACE WATER
Topographic position	TOPOGRAPHY/ELEVATION
Fire regime	WILDFIRE



CONCEPTUAL MODEL FOR MANAGEMENT QUESTIONS RELATED TO FIRE

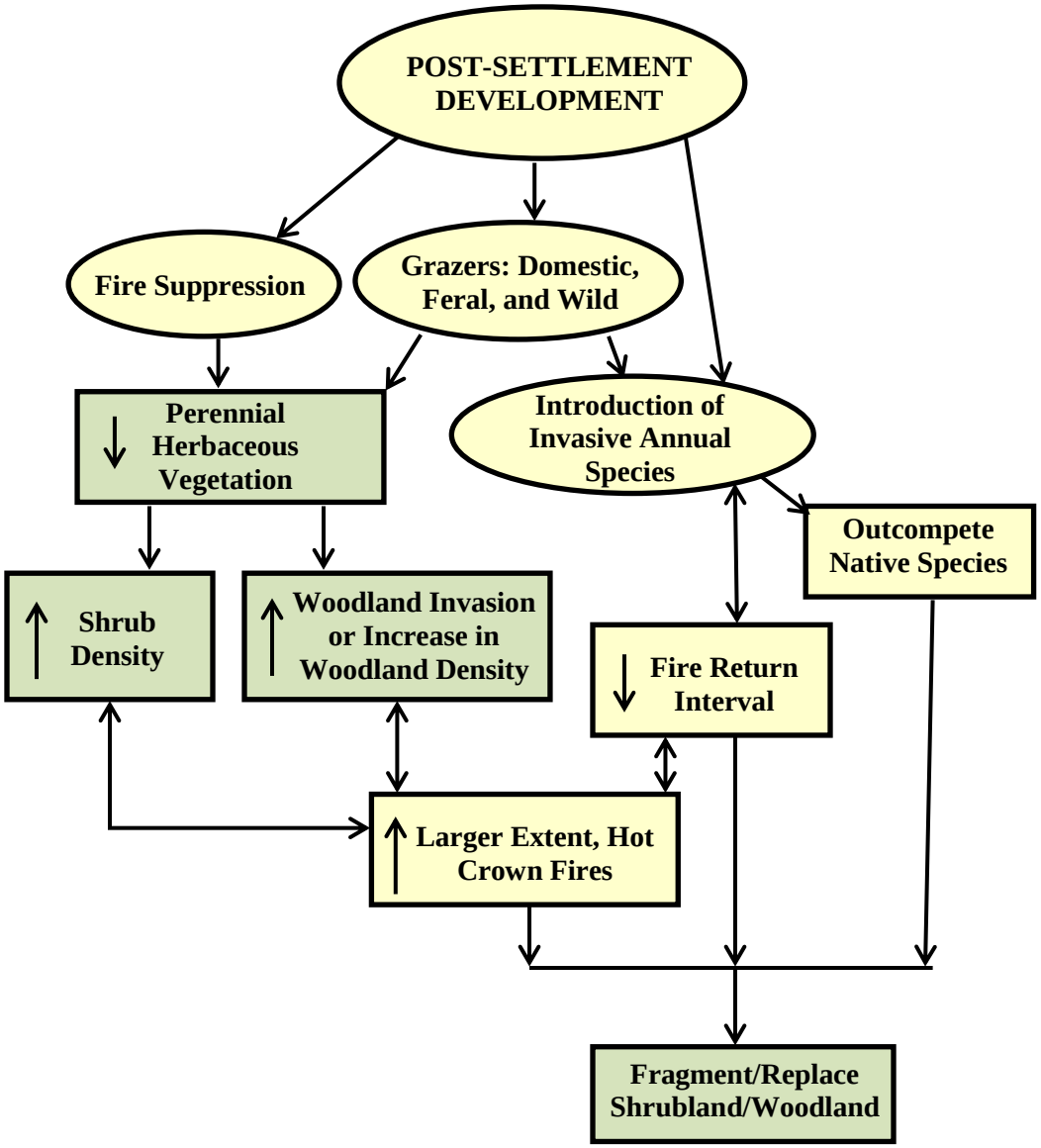
Figure 8. The conceptual model used to assist in conducting the data needs assessment for management questions related to wildfire.

Table 5. Tentative DATA NEEDS associated with management questions related to WILDFIRE as a change agent.

WILDFIRE MANAGEMENT QUESTIONS

- Where are the areas that have been changed by wildfire between 1999 and 2009?
- Where are the areas with potential to change from wildfire?
- Where are the Fire Regime Condition Classifications?
- Where are collaborative strategic prevention actions taking place?
- Where is fire adverse to ecological communities, features, and resources of concern?

TENTATIVE DATA NEEDS	DATA CLASS
Current climate (PRISM, DAYMET).	CLIMATE - CURRENT
Sites of ecological concern	CONSERVATION ELEMENTS
Designated viewsheds	CONSERVATION ELEMENTS
Lighting strike density layer	IGNITION RISK
Human-caused fire layer	IGNITION RISK
Areas where risk of invasive species establishment is high following fire	INVASIVE SPECIES
LANDFIRE (EVT, Canopy Closure, Potential Vegetation)	VEGETATION
Fire History (1999 – 2009)	WILDFIRE
Fire boundary maps	WILDFIRE
Fire severity maps.	WILDFIRE
LANDFIRE (Fire Regime Departure of Condition class)	WILDFIRE
LANDFIRE (Mean Fire Return Interval)	WILDFIRE
LANDFIRE (Simulated Historical percent of Low, Mixed and Replacement Fires)	WILDFIRE
Wildland Urban Interface (WUI)	WILDFIRE MANAGEMENT
County, State, and Federal fire prevention action plans.	WILDFIRE MANAGEMENT



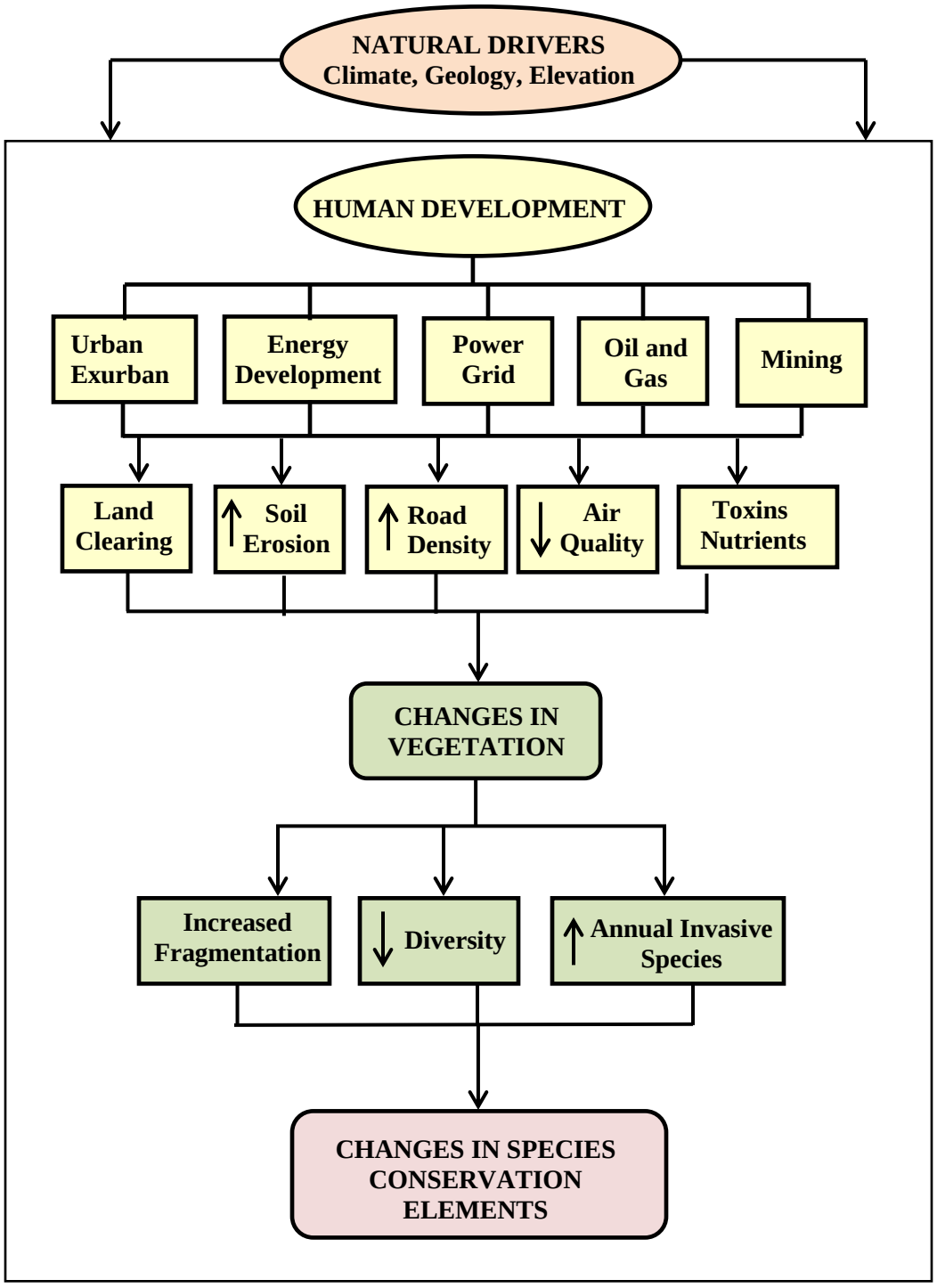
CONCEPTUAL SUBMODEL FOR MANAGEMENT QUESTIONS RELATED TO INVASIVE SPECIES

Figure 9. The conceptual model used to assist in conducting the data needs assessment for management questions related to invasive species.

Table 6. Tentative DATA NEEDS associated with management questions related to INVASIVE SPECIES as change agents.

INVASIVE SPECIES MANAGEMENT QUESTIONS
• Where are areas dominated by this invasive species? • Where are the areas of potential future encroachment from this invasive species? • Where are areas of suitable biophysical setting (precipitation/soils, etc.) with restoration potential?

TENTATIVE DATA NEED	**DATA CLASS**
Current climate (PRISM, DAYMET)	CLIMATE-CURRENT
2060 downscaled climate change data	CLIMATE-FUTURE
human footprint layers	HUMAN FOOTPRINT
Road density	HUMAN FOOTPRINT
Invasive species occurrence data	INVASIVE SPP OCCURRENCE
STATSGO	SOILS
SSURGO	SOILS
NHD	SURFACE WATER
DEM	TOPOGRAPHY/ELEVATION
LANDFIRE (EVT, Canopy Closure, Potential Vegetation)	VEGETATION
Multi-date MODIS EVI.	VEGETATION
LANDFIRE (Fire Regime Departure of Condition class), LANDFIRE (Mean Fire Return Interval), LANDFIRE (Simulated Historical percent of Low, Mixed and Replacement Fires)	WILDFIRE
Recently burned areas	WILDFIRE



CONCEPTUAL MODEL FOR MANAGEMENT QUESTIONS RELATED TO DEVELOPMENT

Figure 10. The conceptual model used to assist in conducting the data needs assessment for management questions related to development.

Table 7. Tentative DATA NEEDS associated with management questions related to DEVELOPMENT as a change agent.

DEVELOPMENT-RELATED MANAGEMENT QUESTIONS

- Where are areas of planned development (e.g., plans of operation, governmental planning)?
- Where are areas of potential development (e.g., under lease), including sites and transmission corridors?
- Where are the surface waters that might be vulnerable to flow reduction as a result of groundwater extraction?

TENTATIVE DATA NEED	DATA CLASS
Compiled human footprint layer	DEVELOPMENT (See APPENDIX12)
Identified transmission corridors	DEVELOPMENT
Leased oil & gas areas	DEVELOPMENT
Leased renewable energy sites	DEVELOPMENT
Roads	DEVELOPMENT
City, County, State, and Federal Development Plans (Current and Potential)	DEVELOPMENT-FUTURE
Mapped conventional energy development areas	DEVELOPMENT-FUTURE
Mapped renewable energy suitability areas.	DEVELOPMENT-FUTURE
Ground Water Extraction Areas	DEVELOP-GROUNDWATER
Monitored wells and longitudinal flow data	DEVELOP-GROUNDWATER
Aquifer locations.	DEVELOPMENT-GROUNDWATER
NLCD	LANDCOVER/LAND USE
STATSGO	SOILS
SSURGO	SOILS
NHD (perennial & possibly intermittent flow classifications)	SURFACE WATER
NWI	SURFACE WATER
DEM (NED)	TOPOGRAPHY/ELEVATION

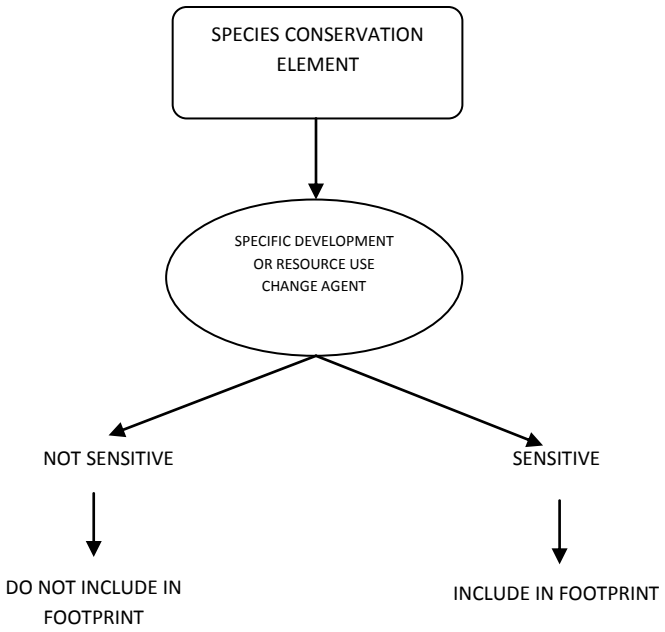


Figure 11. Conceptual model of human footprint component selection for status assessments based on relative sensitivity (negative only) to specific DEVELOPMENT-related disturbance types or change agents. Human disturbance footprint layer development will attribute some types of disturbance as "CONDITIONAL" so that they can be included or excluded from status assessments, depending upon relative sensitivity of the conservation element.

CONCEPTUAL SUBMODEL FOR MANAGEMENT QUESTIONS RELATED TO RESOURCE USE

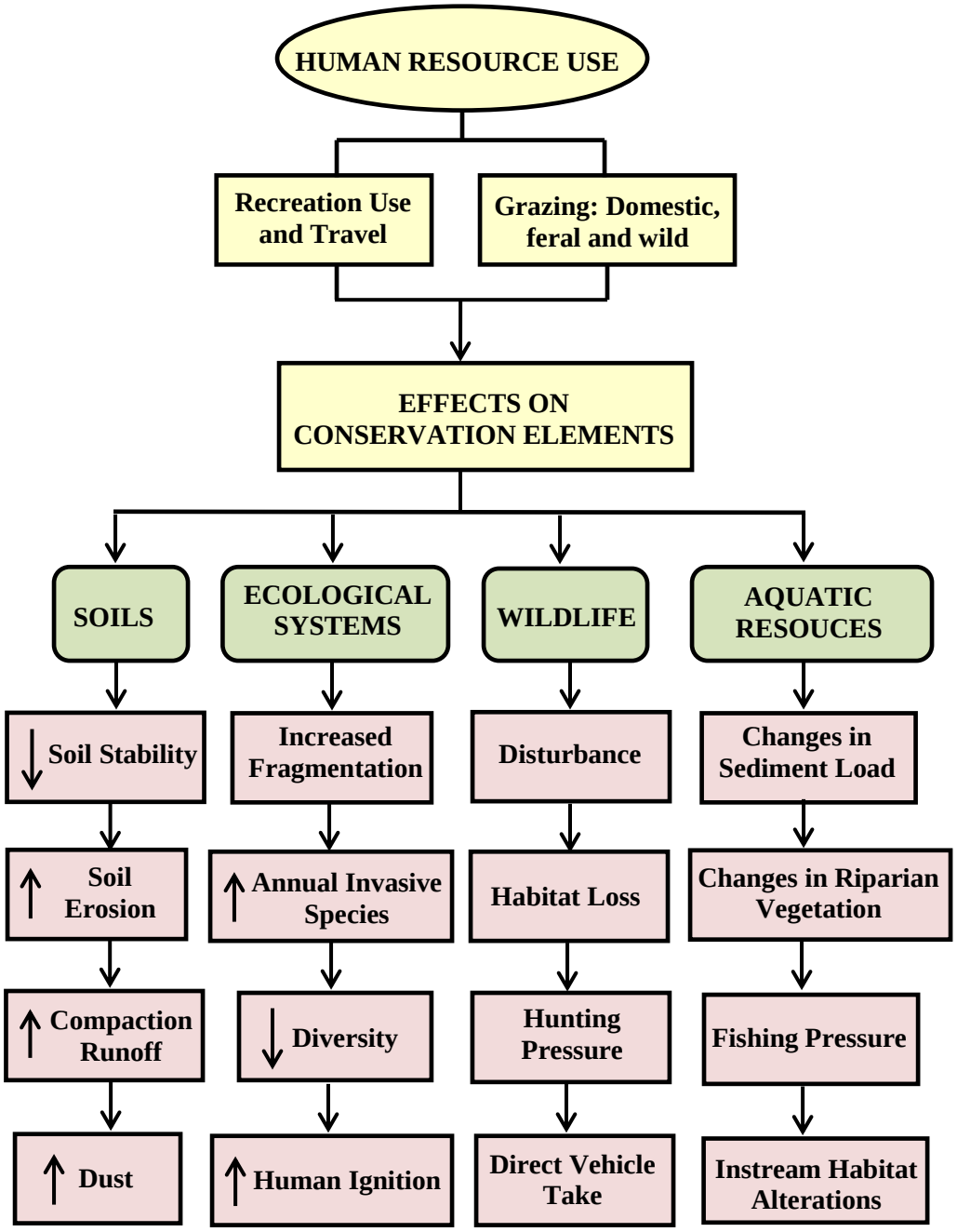


Figure 12. The conceptual model used to assist in conducting the data needs assessment for management questions related to resource uses.

Table 8. Tentative DATA NEEDS associated with management questions related to various RESOURCE USEs as change agents.

RESOURCE USE MANAGEMENT QUESTIONS

- Where are high-use recreation sites, developments, infrastructure or areas of intensive recreation use located (including boating)?
- Where are areas of concentrated recreation travel located (OHV and other travel)?
- Where are permitted areas of intensive recreation use (permit issued)?
- What are planned areas for disposal that may cause change of Federal ownership?
- Where does/has grazing occur/occurred?
- Where/How has grazing impacted the current status of conservation elements?
- Where/How may grazing impact the potential future status of conservation elements?

TENTATIVE DATA NEED	DATA CLASS
Administrative boundaries.	ADMINISTRATIVE BOUNDARIES
Planned Disposal Sites	ADMINISTRATIVE BOUNDARIES
PRISM	CLIMATE - CURRENT
DAYMET	CLIMATE - CURRENT
NLCD	LANDCOVER/LAND USE
Detailed roads data	RESOURCE ACCESS
Areas of higher forage availability (MODIS EVI)	RESOURCE AVAILABILITY
Modeled wildlife habitats	RESOURCE CONDITION
Water quality status	RESOURCE CONDITION
PFC data if available	RESOURCE CONDITION
Rangeland Condition Assessments if available	RESOURCE CONDITION
Urban Areas	RESOURCE PRESSURES
Agricultural census data.	RESOURCE PRESSURES
AU densities and timing	RESOURCE PRESSURES
Recreation management areas and infrastructure	RESOURCE USE AREAS
Permitted use areas	RESOURCE USE AREAS
OHV use areas	RESOURCE USE AREAS
Permitted use areas	RESOURCE USE AREAS
Recreational Sites	RESOURCE USE AREAS
Grazing Allotments	RESOURCE USE AREAS
Ranches/farms	RESOURCE USE AREAS
STATSGO	SOILS
Sensitive Soils layer	SOILS
NHD	SURFACE WATER
Other surface water sources, including wildlife and stock tanks and guzzlers	SURFACE WATER
Lakes database	SURFACE WATER
DEM (NED)	TOPOGRAPHY/ELEVATION
LANDFIRE EVT & BpS	VEGETATION

Table 9. Tentative DATA NEEDS associated with management questions related to AIR QUALITY.

AIR QUALITY MANAGEMENT QUESTIONS
• *Where are the viewsheds adjacent to scenic conservation areas?* • *Where are the viewsheds most vulnerable to change agents?* • *Where are the designated non-attainment areas and Class I PSD areas?*

TENTATIVE DATA NEED	**DATA CLASS**
Non-attainment areas	AIR QUALITY
Relevant Human Footprint components (e.g., energy development areas)	CHANGE AGENTS
PRISM	CLIMATE-CURRENT
DAYMET	CLIMATE-CURRENT
LANDFIRE	VEGETATION
Scenic Conservation Areas	VIEWS
Designated Viewsheds database	VIEWSHEDS

CONCEPTUAL MODEL FOR MANAGEMENT QUESTIONS RELATED TO CLIMATE CHANGE

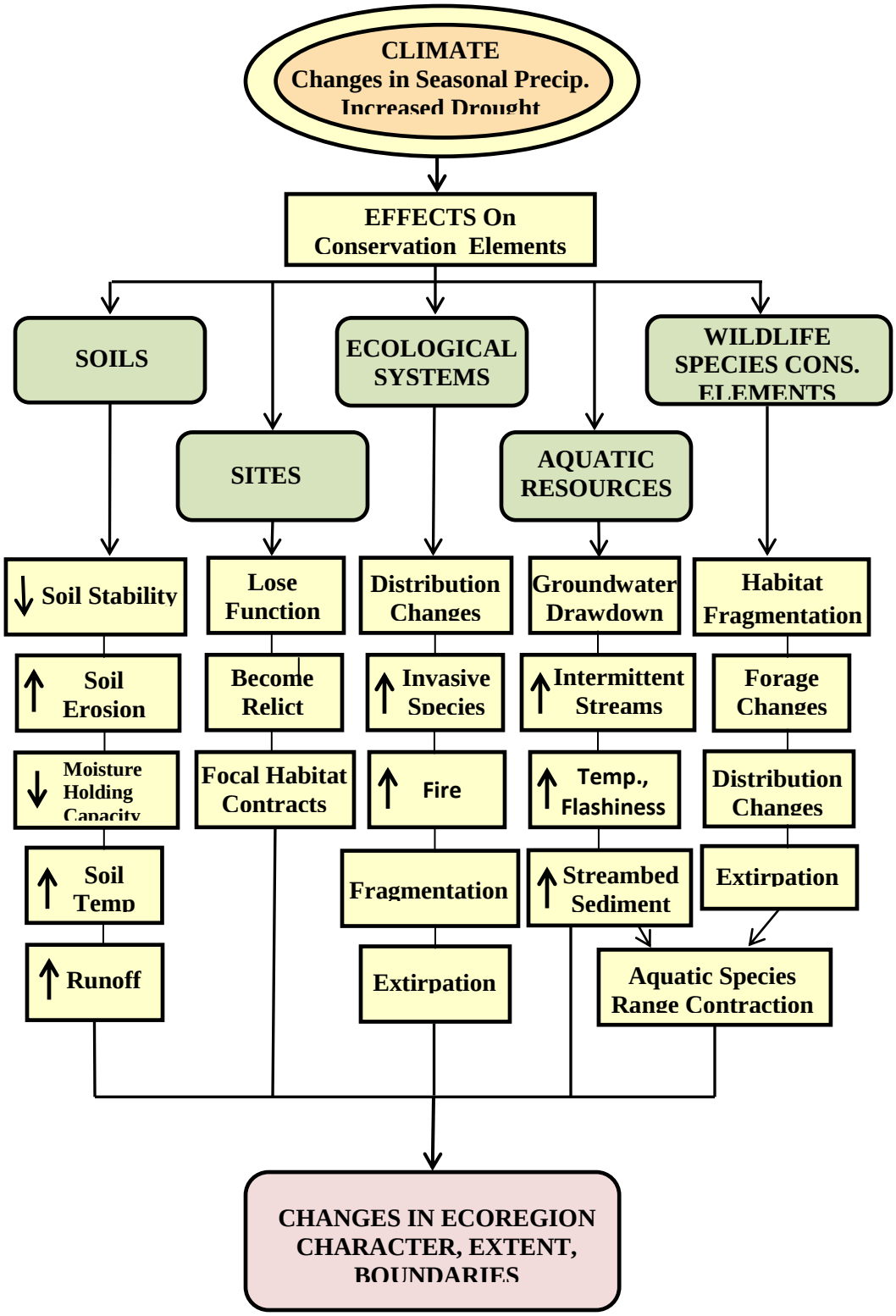


Figure 13. The conceptual model used to assist in conducting the data needs assessment for management questions related to climate change.

Table 10. Tentative DATA NEEDS associated with management questions related to CLIMATE as a change agent.

CLIMATE CHANGE MANAGEMENT QUESTIONS	
• *Where/how will the distribution of dominant native plant species and invasive species change from climate change?* • *Where are areas of potential for fragmentation as a result of climate change in 2060?* • *Where are areas of core conservation species change as a result of climate change?* • *Where are aquatic/riparian areas with potential to change from climate change?*	
TENTATIVE DATA NEED	**DATA CLASS**
PRISM	CLIMATE-CURRENT
DAYMET	CLIMATE-CURRENT
Downscaled 2060 climate data	CLIMATE-FUTURE
Aridity index	CLIMATE-STRESS
Human footprint (current and forecast)	HUMAN FOOTPRINT
Native dominant plant species (characteristic of specific Ecological Systems) occurrence data or current distribution map	PLANT SPECIES OCCURRENCES
STATSGO	SOILS
SSURGO	SOILS
NHD	SURFACE WATER
NWI	SURFACE WATER
NED	TOPOGRAPHY/ELEVATION
LANDFIRE EVT & BpS	VEGETATION

IV. DATA IDENTIFICATION & EVALUATION

4.1 Overview

Data identification and evaluation is a continuation of the process that began with the review and evaluation of the lists of management questions provided by the AMT during the pre-assessment phase. To determine whether to accept, modify, or reject various management questions, the Dynamac team had to envision the types of mapping, analysis, and modeling that might be necessary to answer each category of management question based on conservation elements and guided by the ecoregional conceptual model. This iterative process continues within the data evaluation phase; we have projected possible approaches and the data required to fulfill projected outcomes. A large number of datasets have already been acquired and they continue to come in from various sources. Evaluation efforts will be ongoing for some time and not confined to this pre-workshop timeframe. The object of the data evaluation stage is to match potential data layers to the identified data needs (outlined above in Section III and Appendix 10) and assess the utility of the datasets to map key attributes of conservation elements and address classes of management questions. Each dataset was evaluated according to 11 quality criteria listed in the Data Management Plan (for example, criteria

such as spatial accuracy, thematic accuracy, and precision) and given a confidence score. Confidence scores allow data layers within the same thematic class to be compared and the most suitable one chosen. Data evaluation tables and scores will assist the AMT in making decisions on the choice of datasets to use in the assessment phase.

The Dynamac team began the data evaluation by examining the data layers provided by BLM and classifying them into groups matching classes of management questions and sub-models of the basic ecoregional conceptual model. The systematic classification of data layers and management questions helped to expose data gaps. We sought additional data layers from a wide range of sources and we continue to receive data from BLM and agency partners. Data quality evaluations are necessary to ensure that the selected datasets are the optimal choices among a group of similar or redundant data layers. Although we were not required to evaluate the datasets provided by BLM, we did assess some qualitative aspects of these data layers so that they could be compared with other acquired data layers. The complete results of the evaluations to date are detailed in the accompanying EXCEL file *Data_Evaluation_20101018_WCODES_COP.xlsx*.

4.2 Evaluation Approach

GIS data layers evaluation

Data evaluation started with identifying the needs for ecoregion assessment defined under Task 1 Management Questions, Conservation Elements, and Change Agents. The main sources of data were federal and state on-line data bases. Other sources included private and non-profit organizations, universities, and other conservation agencies. Data layers that were identified as valuable and needed for the Colorado Plateau REA were downloaded, uncompressed if necessary, opened in ArcMap, and evaluated with regard to geographic extent and attribute table content. The other independent source of data layers was the hard drive from BLM's National Operations Center (NOC) that was delivered to the Dynamac team on September 17, 2010.

The accurate geographic extent of the Colorado Plateaus Level III ecoregion was established by selecting this ecoregion from the shapefile downloaded from: http://www.epa.gov/wed/pages/ecoregions/level_iii_iv.htm (Eco_Level_III_US. shp). This data layer was created and published by the U.S. Environmental and Protection Agency in 1995 and is continually modified as new states are added. The most recent update occurred in 2010.

Following the recommendations from the DMP document (Data Management Contractor Guidance), the extent of Colorado Plateau was buffered by including all 5th-Level (10-digit) Watersheds (as defined by the Watershed Boundary Database) that intersect the boundary of Colorado Plateau. The watershed boundary was downloaded from ftp://gateway2.ftw.nrcs.usda.gov/Gateway/WBD/ and data set with the time stamp August 31, 2010 was used for buffering (see Figures 14 and 15). All data layers which are to be created during the modeling process under this REA and any other GIS layers delivered to BLM NOC will be clipped to this buffered extent (as required by the DMP).

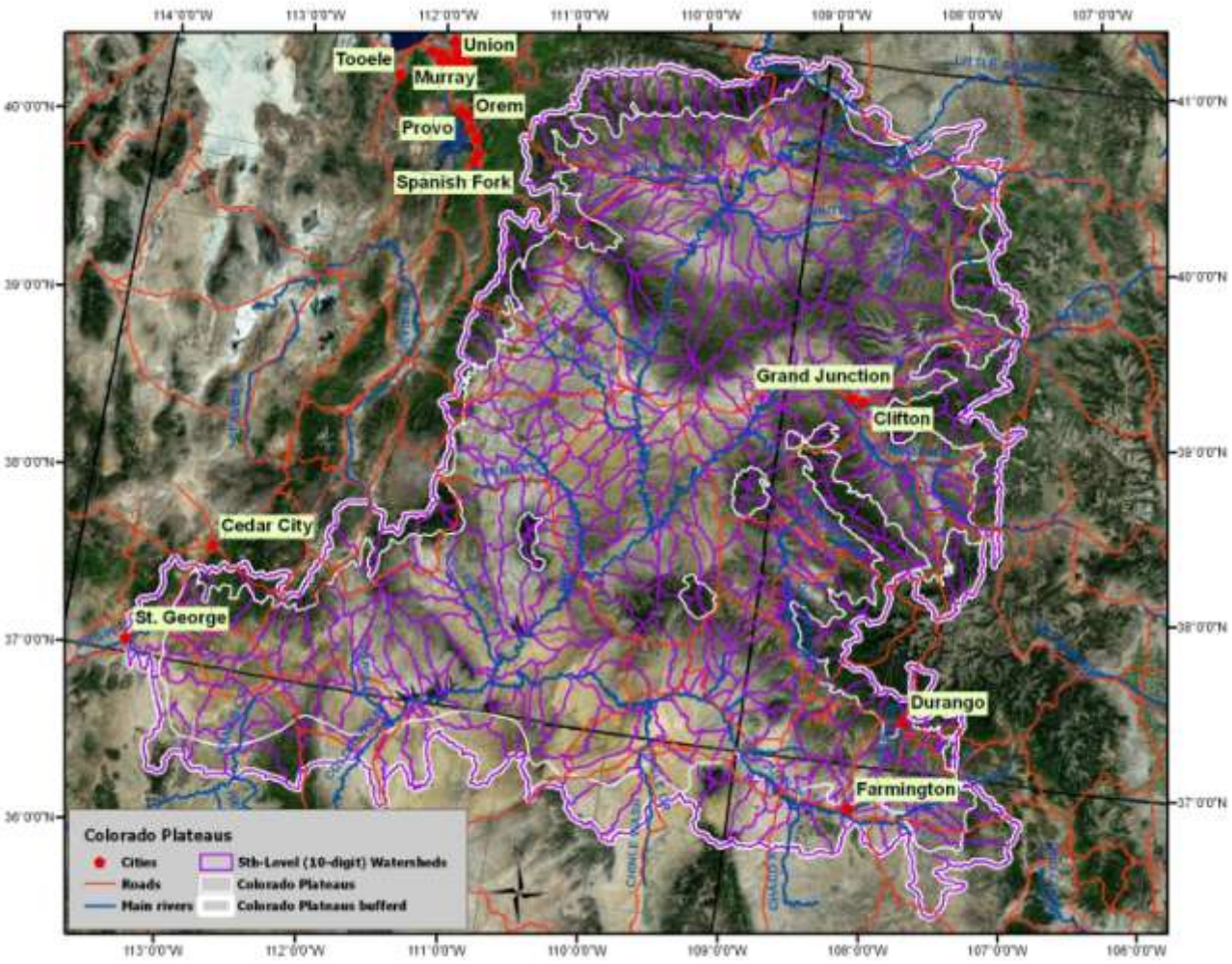


Figure 14. Colorado Plateau ecoregion buffered by 5th-Level Hydrologic Units.

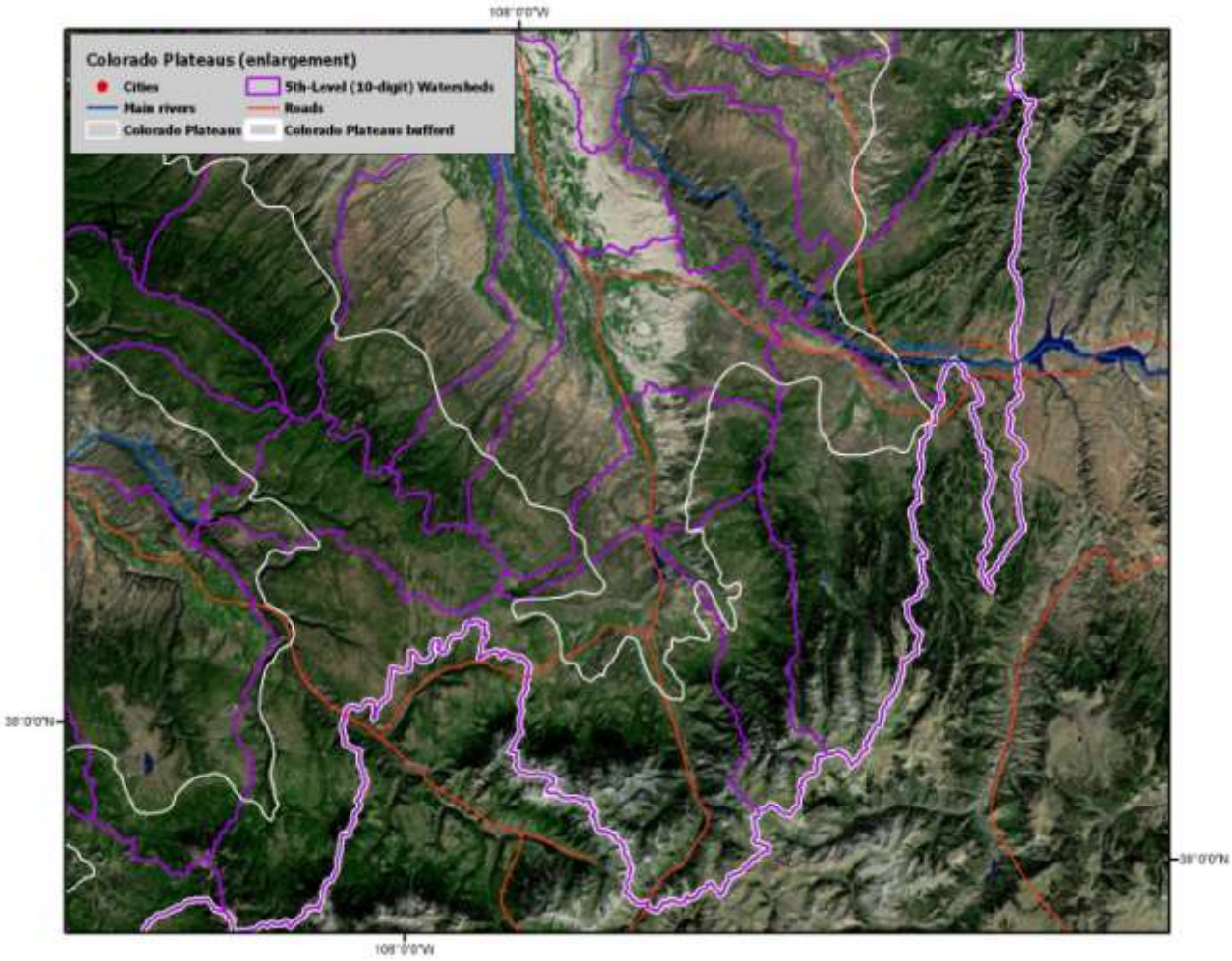


Figure 15. Enlargement of a selected area of Figure 14 showing the buffered area in more detail.

First the collected GIS data layers were evaluated with regard to the accuracy of their geographic extent. The location of all available GIS data layers was visually inspected versus MDA Information Systems Inc.'s NaturalVue product – orthorectified 15-m resolution simulated "natural color" Landsat mosaic, as shown in the background of Figures 14 and 15 (more information on NaturalVue product can be obtained from: http://www.mdafederal.com/digital-imaging/earthsat-naturalvue). During this inspection it was also recorded if the Colorado Plateau ecoregion was fully covered by an inspected data layer. If the coverage was only partial, the portion of the ecoregion covered was noted. The next step of evaluation included collecting information about the agency that created the data layer, the year in which the layer was published or was available, any accompanying metadata and its compliance with Federal Geographic Data Committee (FGDC) standards, type of data (raster, vector), its resolution (if applicable and/or information was provided), and any other additional pertinent information. The Dynamac team also made an attempt to find information with regard to existing ground truth, on which an accuracy of a GIS vector

or raster layer was validated. As expected, such information existed only for a few data layers, mostly for land cover data.

All information described above on collected data layers is summarized in the Excel spreadsheet (an attachment to this document "Data_evaluation_Dynamc_2010_10_13.xlsx"), in which the links to data sources are included.

The next step of evaluation required by the DMP quality control included 11 criteria: 1) Validity, 2) Non-Duplication, 3) Completeness, 4) Relationship Validity, 5) Consistency, 6) Concurrency, 7) Timeliness, 8) Spatial Accuracy, 9) Thematic Accuracy, 10) Precision, and 11) Derivation Integrity. Using the DMP evaluation criteria and rating scale (DMP document: Appendix 7 and pages 27–29) the Dynamac team came up with a numeric scale and assigned values from 4 (Very High Confidence) to 0 (Unknown). The maximum possible score that the evaluated layer could gain was 44.

In order to perform a thorough examination based on these criteria, an additional search was required for needed information. Unless the file was accompanied by FGDC metadata having all this information included, the search turned out to be very time-consuming and often still did not give a fully objective answer. Using these 11 criteria, the Dynamac team only evaluated the data layers which came from sources other than BLM NOC (hard drive), totaling 44 data layers as of October 15, 2010 (please see Data_evaluation_Dynamc_2010_10_13.xlsx, "Dynamac" tab). Unfortunately, the Dynamac team is still uncertain about many scores which were assigned to each criterion of evaluated data layers. Given that not all data layers are available at this moment to the Dynamac team and that the final decisions as to what data layers will be used in models have not been made, the Dynamac team contacted a GIS representative for REA at BLM NOC (Mathew Bobo) and discussed these issues. It was agreed that the full (based on 11 criteria) evaluation will be delivered together with the work plan for the Colorado Plateau at the completion of Task 4 of Phase 1. The final evaluation will be supplemented with descriptive information about the quality and value of each data layer to be used in models for the REA. This supplemental information may be more useful to AMT's representatives than the numeric confidence scores.

4.3 Evaluation by Management Question Group

A convenient framework for data layer identification and evaluation is a review by logical groupings of management questions. There are overlaps between subjects between these groups, as one might expect. This approach helps to identify which management questions can be addressed based on data identified and evaluated to date. Preliminary results of the data identification and evaluation are shown in Tables 11–14 below.

Table 11. Data layers identified and EVALUATED for the SOILS and CRYPTOGAMIC CRUST related Management Questions.

PRIMARY CLASS	SECONDARY CLASS	DATA LAYER DECRIPTION	CREATED BY	DATA FORMAT	COP extent coverage (full/partial/none)	CONFIDENCE SCORE	RECOMMENDED
BASE LAYERS	ELEVATION	Elevation - National Elevation Dataset (NED)	U.S Geological Survey	30-m raster	full	na	**YES**
BASE LAYERS	ELEVATION	Elevation - National Elevation Dataset (NED)	U.S Geological Survey	3-m raster	full	na	**IF NEEDED**
BASE LAYERS	ELEVATION	Elevation Derivatives for National Applications (EDNA)	USGS - (USGS EROS, USGS/NMD, USGS/WRD, NSSL, & EPA)	30-m raster	full	na	**YES**
BASE LAYERS	SOILS	National Soil Information System (NASIS) - General Soils Map STATSGO2	USDA, US Department of Agriculture	shapefile polygon	full	na	**YES**
CHANGE AGENT	RESOURCE USE	Grazing Allotments (Clip for SOD, COP)	unknown	unknown	unknown	na	**YES**
CONSERV. ELEMENT	SURFACE WATER	National Hydrography Dataset(NHD Model)	U.S Geological Survey	Points, Polylines, & Polygons Shapefiles	full	na	**YES**
BASE LAYERS	CLIMATE	DAYMET		1000-m raster	full	TBD	**YES**
BASE LAYERS	SURFICIAL GEOLOGY						**YES**

Table 12. Data layers identified and EVALUATED for the SURFACE AND GROUND WATER related Management Questions.

PRIMARY CLASS	SECONDARY CLASS	DATA LAYER DESCRIPTION	CREATED BY	DATA FORMAT	COP extent coverage (full/partial/ none)	CONFIDENCE SCORE	RECOMMENDED
BASE LAYERS	COUNTY	County Boundaries - (COP, SOD)	Bureau of Land Management	shapefile polygon	full	na	**YES**
BASE LAYERS	ELEVATION	Elevation - National Elevation Dataset (NED)	U.S Geological Survey	30-m raster	full	na	**YES**
BASE LAYERS	ELEVATION	Elevation - National Elevation Dataset (NED)	U.S Geological Survey	3-m raster	full	na	**IF NEEDED**
BASE LAYERS	ELEVATION	Elevation Derivatives for National Applications (EDNA)	USGS - (USGS EROS, USGS/NMD, USGS/WRD, NSSL, & EPA)	30-m raster	Complete	na	**YES**
CHANGE AGENT	DEVELOPMENT	Estimated use of water in the United States by County	U.S Geological Survey	dbf IV Table Format	Full	na	**YES**
CHANGE AGENT	DEVELOPMENT	Cities and Towns of the United States	USGS - National Atlas of the United States	shapefile points	Full	na	**IF NEEDED**
CHANGE AGENT	DEVELOPMENT	The National Waterway Network (Lines and Points)	Research and Innovative Technology Administration' s Bureau of Transportation Statistics (RITA/BTS)	shapefile polylines / shapefile points	Partial (updated continually)	na	**YES**
CONSERV. ELEMENT	SURFACE WATER	National Hydrography Dataset(NHD Model)	U.S Geological Survey	Points, Polylines, & Polygons Shapefiles	Full	na	**YES**
CONSERV. ELEMENT	SURFACE WATER	Watershed Boundary Datasets (WBD)	USDA, NRCS - National Resources Conservation Service	Polylines & Polygon Shapefiles	Full	na	**YES**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Arizona - Wetland Polygon	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**YES**

Table 12. (Continued) Data layers identified and EVALUATED for the SURFACE AND GROUND WATER related Management Questions

PRIMARY CLASS	SECONDARY CLASS	DATA LAYER DESCRIPTION	CREATED BY	DATA FORMAT	COP extent coverage (full/partial/ none)	CONFIDENCE SCORE	RECOMMENDED
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Arizona - Historic Map Info.	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**IF NEEDED**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Colorado - Wetland Polygon Info.	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**YES**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Colorado - Historic Map Info	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**IF NEEDED**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - New Mexico - Wetland Polygon Info.	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**YES**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - New Mexico - Historic Map Info	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**IF NEEDED**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Utah - Wetland Polygon Info.	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**YES**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Utah - Historic Map Info	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**IF NEEDED**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	Springs	USGS	Data table	full		**YES**

Table 13. Data layers identified and EVALUATED for the ECOLOGICAL SYSTEMS related Management Questions.

PRIMARY CLASS	SECONDARY CLASS	DATA LAYER DESCRIPTION	CREATED BY	DATA FORMAT	COP extent coverage (full/partial/none)	CONFIDENCE SCORE	RECOMMENDED
BASE LAYERS	ELEVATION	Elevation - National Elevation Dataset (NED)	U.S Geological Survey	30-m raster	Full	na	**YES**
BASE LAYERS	ELEVATION	Elevation - National Elevation Dataset (NED)	U.S Geological Survey	3-m raster	Full	na	**IF NEEDED**
BASE LAYERS	ELEVATION	Elevation Derivatives for National Applications (EDNA)	USGS - (USGS EROS, USGS/NMD, USGS/WRD, NSSL, & EPA)	30-m raster	Full	na	**YES**
BASE LAYERS	SOILS	National Soil Information System (NASIS) - General Soils Map STATSGO2	USDA, US Department of Agriculture	shapefile polygon	Full	na	**YES**
CONSERV. ELEMENT	VEGETATION	Southwest Gap Analysis Project	United States Geological Survey, EROS Data Center, National Elevation Dataset	30-m raster	Complete	na	**NO**
CONSERV. ELEMENT	SURFACE WATER	National Hydrography Dataset(NHD Model)	U.S Geological Survey	Points, Polylines, & Polygons Shapefiles	Full	na	**YES**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Arizona - Wetland Polygon	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**YES**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Arizona - Historic Map Info.	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**IF NEEDED**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - California - Historic Map Info	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**IF NEEDED**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Colorado - Wetland Polygon Info.	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**YES**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Colorado - Historic Map Info	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**IF NEEDED**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - New Mexico - Wetland Polygon Info.	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**YES**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - New Mexico - Historic Map Info	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**IF NEEDED**

Table 13. (Continued) Data layers identified and EVALUATED for the ECOLOGICAL SYSTEMS related Management Questions.

PRIMARY CLASS	SECONDARY CLASS	DATA LAYER DESCRIPTION	CREATED BY	DATA FORMAT	COP extent coverage (full/partial/none)	CONFIDENCE SCORE	RECOMMENDED
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Utah - Wetland Polygon Info.	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**YES**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Utah - Historic Map Info	U.S. Fish and Wildlife Service	shapefile polygon	Full		**IF NEEDED**
CONSERV. ELEMENT	ECOLOGICAL SYSTEMS	LANDFIRE data layers	USDA FS, DOI	30-m raster	Full	43	**YES**
CONSERV. ELEMENT	ECOLOGICAL SYSTEMS	SWReGAP	A multi-institutional cooperative effort to map and assess biodiversity for a five-state region; USGS coordination; AR, CO, NE, NM, UT	30-m raster, MMU 1 acre (0.40 hectares)	COP (full) SOD (partial)	22	**NO**

Table 14. Data layers identified and EVALUATED for the SPECIES conservation element related Management Questions.

PRIMARY CLASS	SECONDARY CLASS	DATA LAYER DESCRIPTION	CREATED BY	DATA FORMAT	COP extent coverage (full/partial/none)	CONFIDENCE SCORE	RECOMMENDED
BASE LAYERS	ELEVATION	Elevation - National Elevation Dataset (NED)	U.S Geological Survey	30-m raster	full	na	**YES**
BASE LAYERS	ELEVATION	Elevation - National Elevation Dataset (NED)	U.S Geological Survey	3-m raster	full	na	**IF NEEDED**
BASE LAYERS	ELEVATION	Elevation Derivatives for National Applications (EDNA)	USGS - (USGS EROS, USGS/NMD, USGS/WRD, NSSL, & EPA)	30-m raster	Complete	na	**YES**
BASE LAYERS	SOILS	National Soil Information System (NASIS) - General Soils Map STATSGO2	USDA, US Department of Agriculture	shapefile polygon	Full	na	**YES**
CONSERV. ELEMENT	VEGETATION	Southwest Gap Analysis Project	United States Geological Survey, EROS Data Center, National Elevation Dataset	30-m raster	Complete	na	**IF NEEDED**
CHANGE AGENT	RESOURCE USE	Grazing Allotments (Clip for SOD, COP)	unknown	unknown	unknown	na	**YES**
CONSERV. ELEMENT	SITES	BBS Grid: Bird Breeding Survey, Bird Counts, Bird Occurances (COP, SOD CLIP)	USGS Patuxent Wildlife Research Center	shapefile polygon	full	na	**YES**
CONSERV. ELEMENT	SITES	NABBS 2003 - Version 2004.1 (Clip COP, SOD)	USGS Patuxent Wildlife Research Center	shapefile polyline	full	na	**YES**
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse Brood Area	Colorado Division of Wildlife	shapefile polygon	Partial, In work	na	**Tbd**
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse Historical Habitat	Colorado Division of Wildlife	shapefile polygon	Partial, In work	na	**Tbd**
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse Overall Range	Colorado Division of Wildlife	shapefile polygon	Partial, In work	na	**Tbd**
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse Production Area	Colorado Division of Wildlife	shapefile polygon	Partial, In work	na	**Tbd**
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse Severe Winter Range	Colorado Division of Wildlife	shapefile polygon	Partial, In work	na	**Tbd**
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse Winter Range	Colorado Division of Wildlife	shapefile polygon	Partial, In work	na	**Tbd**
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse Habitat Range	NatureServe	shapefile polygon	Full	na	**YES**
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse - Occupied Habitat Status	Colorado Division of Wildlife	shapefile polygon	Partial, In work	na	**Tbd**

Table 14. (Continued) Data layers identified and EVALUATED for the SPECIES conservation element related Management Questions.

PRIMARY CLASS	SECONDARY CLASS	DATA LAYER DESCRIPTION	CREATED BY	DATA FORMAT	COP extent coverage (full/partial/none)	CONFIDENCE SCORE	RECOMMENDED
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse - Utah	The State of Utah School and Institutional Trust Lands Administration, The Bureau of Land Management	shapefile polygon	Partial, In work	na	**Tbd**
CONSERV. ELEMENT	SITES	RMBO - point transects 1998 to 2009	Rocky Mountain Bird Observatory	shapefile points	full	na	**YES**
CONSERV. ELEMENT	SPECIES	Mule Deer Covers - Class A	unknown	shapfile polygon	N/A	na	**Tbd**
CONSERV. ELEMENT	SPECIES	Mule Deer Covers - Class B	unknown	shapfile polygon	N/A	na	**Tbd**
CONSERV. ELEMENT	SPECIES	Mule Deer Covers - Class C	unknown	shapfile polygon	N/A	na	**Tbd**
CONSERV. ELEMENT	SPECIES	Mule Deer Covers - Class D	unknown	shapfile polygon	N/A	na	**Tbd**
CONSERV. ELEMENT	SPECIES	Mule Deer Covers - Class E	unknown	shapfile polygon	N/A	na	**Tbd**
CONSERV. ELEMENT	SPECIES	Mule Deer Covers - Class F	unknown	shapfile polygon	N/A	na	**Tbd**
CONSERV. ELEMENT	SPECIES	New Mexico Mule Deer Cover	unknown	shapfile polygon	N/A	na	**Tbd**
CONSERV. ELEMENT	SPECIES	US Mule Deer Cover	unknown	shapfile polygon	N/A	na	**Tbd**
CONSERV. ELEMENT	SPECIES	Critical Habitat - Endangered and threatened species	U.S. Fish and Wildlife Service	shapefile polygon/polyline		na	**Tbd**
CONSERV. ELEMENT	SITES	Protected Areas of the US (PADUS) - Clip of SOD & COP	US National Gap Analysis Program	shapefile polygon	Planned (update as needed)	na	**YES**
CONSERV. ELEMENT	SURFACE WATER	National Hydrography Dataset(NHD Model)	U.S Geological Survey	Points, Polylines, & Polygons Shapefiles	Full	na	**YES**
CONSERV. ELEMENT	SURFACE WATER	Watershed Boundary Datasets (WBD)	USDA, NRCS - National Resources Conservation Service	Polylines & Polygon Shapefiles	Full	na	**YES**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Arizona - Wetland Polygon	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**YES**

Table 14. (Continued) Data layers identified and EVALUATED for the SPECIES conservation element related Management Questions.

PRIMARY CLASS	SECONDARY CLASS	DATA LAYER DESCRIPTION	CREATED BY	DATA FORMAT	COP extent coverage (full/partial/none)	CONFIDENCE SCORE	RECOMMENDED
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Arizona - Historic Map Info.	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**IF NEEDED**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Colorado - Wetland Polygon Info.	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**YES**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Colorado - Historic Map Info	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**IF NEEDED**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - New Mexico - Wetland Polygon Info.	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**YES**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - New Mexico - Historic Map Info	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**IF NEEDED**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Utah - Wetland Polygon Info.	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**YES**
CONSERV. ELEMENT	ECOLOGICAL SYSTEM	NWI - Utah - Historic Map Info	U.S. Fish and Wildlife Service	shapefile polygon	Full	na	**IF NEEDED**
CONSERV. ELEMENT	FINE-FILTER	Ranges of tree species in North America	USGS Geology and Environmental Change Science Center	shapefile polygon	full	**19**	**YES**
CONSERV. ELEMENT	SPECIES	Digital Distribution Maps of the Mammals of the Western Hemisphere Version 3.0	NatureServe	shapefile polygon / shapefile points	full (Updates as needed)	**17**	**Tbd**
CONSERV. ELEMENT	SPECIES	SWReGAP Project Data (Landcover, Elevation, Slope, Aspect, Distance to Water, landform, Soils, Hydro, & Mountains)	USGS - Gap Project	30-m raster / shapefile polygon, polyline, & points	full	**22**	**Possible**

Table 14. (Continued) Data layers identified and EVALUATED for the SPECIES conservation element related Management Questions.

PRIMARY CLASS	SECONDARY CLASS	DATA LAYER DESCRIPTION	CREATED BY	DATA FORMAT	COP extent coverage (full/partial/ none)	CONFIDENCE SCORE	RECOMMENDED
CONSERV. ELEMENT	SPECIES	GIS Hunting Data: Habitat, Endangered Species, Boundaries, & Misc. Data	Utah Division of Wildlife Resources	shapefile polygons	full	**17**	**YES**
CONSERV. ELEMENT	SPECIES	Species and Habitat Summary	Arizona Department of Transportation	shapefile polygons	full	**17**	**Tbd**
CONSERV. ELEMENT	SPECIES	Digital Distribution Maps of the Birds of the Western Hemisphere Version 3.0	NatureServe Digital Distribution Maps of the Birds of the Western Hemisphere Version 3.0	shapefile polygon / shapefile points	full (Updates as needed)	**17**	**Tbd**
CONSERV. ELEMENT	SPECIES	Priority Conservation Areas in Western North America, Version 1	Conservation areas in US Geodatabase	Geodatabase	FULL	**31**	**YES**
CONSERV. ELEMENT	SPECIES	Priority Conservation Areas in Western North America, Version 1	Conservation areas in US Geodatabase	XML Files	FULL	**1**	**NA**
CONSERV. ELEMENT	ECOLOGICAL SYSTEMS	LANDFIRE data layers	USDA FS, DOI	30-m raster	full	**43**	**YES**
CONSERV. ELEMENT	ECOLOGICAL SYSTEMS	SWReGAP	A multi-institutional cooperative effort to map and assess biodiversity for a five-state region; USGS coordination; AR, CO, NE, NM, UT	30-m raster, MMU 1 acre (0.40 hectares)	full	**22**	**NO**
CONSERV. ELEMENT / CHANGE AGENTS	CANOPY / DEVELOPMENT	NLCD Landcover 1992	Multi-Resolution Land Characteristics Consortium (MRLC)	30-m raster	full	**22**	**YES**

Table 14. (Continued) Data layers identified and EVALUATED for the SPECIES conservation element related Management Questions.

PRIMARY CLASS	SECONDARY CLASS	DATA LAYER DESCRIPTION	CREATED BY	DATA FORMAT	COP extent coverage (full/partial/none)	CONFIDENCE SCORE	RECOMMENDED
CONSERV. ELEMENT	SITES	BBS Grid: Bird Breeding Survey, Bird Counts, Bird Occurances (COP, SOD CLIP)	USGS Patuxent Wildlife Research Center	shapefile polygon	full	na	**YES**
CONSERV. ELEMENT	SITES	NABBS 2003 - Version 2004.1 (Clip COP, SOD)	USGS Patuxent Wildlife Research Center	shapefile polyline	full	na	**YES**
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse Brood Area	Colorado Division of Wildlife	shapefile polygon	Partial, In work	na	**YES**
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse Historical Habitat	Colorado Division of Wildlife	shapefile polygon	Partial, In work	na	**YES**
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse Overall Range	Colorado Division of Wildlife	shapefile polygon	Partial, In work	na	**YES**
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse Production Area	Colorado Division of Wildlife	shapefile polygon	Partial, In work	na	**YES**
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse Severe Winter Range	Colorado Division of Wildlife	shapefile polygon	Partial, In work	na	**YES**
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse Winter Range	Colorado Division of Wildlife	shapefile polygon	Partial, In work	na	**YES**
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse Habitat Range	NatureServe	shapefile polygon	Full	na	**NO**
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse - Occupied Habitat Status	Colorado Division of Wildlife	shapefile polygon	Partial, In work	na	**YES**
CONSERV. ELEMENT	SPECIES	Gunnison's Sage Grouse - Utah	The State of Utah School and Institutional Trust Lands Administration, The Bureau of Land Management	shapefile polygon	Partial, In work	na	**Tbd**
CONSERV. ELEMENT	SITES	RMBO - point transects 1998 to 2009	Rocky Mountain Bird Observatory	shapefile points	full	na	**YES**
CONSERV. ELEMENT	SPECIES	Mule Deer Covers - Class A	unknown	shapfile polygon	N/A	na	**Tbd**
CONSERV. ELEMENT	SPECIES	Mule Deer Covers - Class B	unknown	shapfile polygon	N/A	na	**Tbd**
CONSERV. ELEMENT	SPECIES	Mule Deer Covers - Class C	unknown	shapfile polygon	N/A	na	**Tbd**

Table 14. (Continued) Data layers identified and EVALUATED for the SPECIES conservation element related Management Questions.

PRIMARY CLASS	SECONDARY CLASS	DATA LAYER DESCRIPTION	CREATED BY	DATA FORMAT	COP extent coverage (full/partial/none)	CONFIDENCE SCORE	RECOMMENDED
CONSERV. ELEMENT	SPECIES	Mule Deer Covers - Class D	unknown	shapfile polygon	N/A	na	**Tbd**
CONSERV. ELEMENT	SPECIES	Mule Deer Covers - Class E	unknown	shapfile polygon	N/A	na	**Tbd**
CONSERV. ELEMENT	SPECIES	Mule Deer Covers - Class F	unknown	shapfile polygon	N/A	na	**Tbd**
CONSERV. ELEMENT	SPECIES	New Mexico Mule Deer Cover	unknown	shapfile polygon	N/A	na	**Tbd**
CONSERV. ELEMENT	SPECIES	US Mule Deer Cover	unknown	shapfile polygon	N/A	na	**YES**
CONSERV. ELEMENT	SPECIES	Critical Habitat - Endangered and threatened species	U.S. Fish and Wildlife Service	shapefile polygon/polyline		na	**YES**
CONSERV. ELEMENT	SITES	Protected Areas of the US (PADUS) - Clip of SOD & COP	US National Gap Analysis Program	shapefile polygon	Planned (update as needed)	na	**YES**
CONSERV. ELEMENT	SURFACE WATER	National Hydrography Dataset(NHD Model)	U.S Geological Survey	Points, Polylines, & Polygons Shapefiles	Full	na	**YES**

V. DATA GAP IDENTIFICATION

5.1 Overview

In this section we review the data yet required to address specific conservation elements and change agents. A number of data layers and sources of layers have been identified which will likely fill many of the data gaps, but are yet to be evaluated. Those with evaluation status listed as "Tbd" (to be determined) in the tables have data which has been identified, but awaits full evaluation. Much of the geospatial data of importance for specific conservation elements are available for only a portion of the ecoregion. State wildlife habitat maps represent but one example. We have denoted clear data gaps under the EVALUATION column as "DATA GAP". These represent high priority data needs. We anticipate that we will identify many more data sources for conservation elements through the workshop process. This section is intended to identify gaps or potential gaps for specific conservation elements or change agents to help solicit suggestions from workshop participants.

Tables 15 through 31 define the specific conservation elements and change agents and list files or links which have been identified as possible data sources, and clearly identify specific gaps which must be filled. Ecological Systems are not shown, since they will be defined based on LANDFIRE only.

Table 15. Tentative DATA GAPS for LANDSCAPE SPECIES for the Colorado Plateau.

SPECIES	SCIENTIFIC NAME	IDENTIFIED DATA	EVALUATION
Mountain lion	*Puma concolor*	Natural Heritage Data (DATA GAP); SWReGAP Distribution Model	Tbd
American peregrine falcon	*Falco peregrinus*	Natural Heritage Data (DATA GAP); SWReGAP Distribution Model	Tbd
Big free-tailed bat	*Nyctinomops macrotis*	Natural Heritage Data (DATA GAP); SWReGAP Distribution Model	Tbd
Desert Bighorn sheep	*Ovis canadensis*	Natural Heritage Data (DATA GAP); SWReGAP Distribution Model	Tbd
Bobcat	*Lynx rufus*	Natural Heritage Data (DATA GAP); SWReGAP Distribution Model	Tbd
Kit fox	*Vulpes macrotis*	Natural Heritage Data (DATA GAP); SWReGAP Distribution Model	Tbd
Burrowing owl	*Athene cunicularia*	Natural Heritage Data (DATA GAP); SWReGAP Distribution Model	Tbd
Yellow-breasted chat	*Icteria virens*	Natural Heritage Data (DATA GAP); SWReGAP Distribution Model	Tbd
Razorback sucker	*Xyrauchen texanus*	TNCAZ_Freshwater_Assessment_GIS.zip; Western Native Fish Database 10.2007.mdb	Tbd
Colorado River cutthroat	*Oncorhynchus clarkii pleuriticus*	TNCAZ_Freshwater_Assessment_GIS.zip; Western Native Fish Database 10.2007.mdb	Tbd

Table 16.Tentative DATA GAPS for DESIRED SPECIES Conservation Elements for the Colorado Plateau Ecoregion.

SPECIES	SCIENTIFIC NAME	IDENTIFIED DATA	EVALUATION
Golden eagle	*Aquila chrysaetos*	Natural Heritage Data (DATA GAP); SWReGAP Distribution Model	Tbd
Gunnison sage-grouse	*Centrocercus minimus*	Natural Heritage Data (DATA GAP); SWReGAP Distribution Model	Tbd
Gunnison's prairie dog	*Cynomys gunnisoni*	Natural Heritage Data (DATA GAP); SWReGAP Distribution Model	Tbd
White-tailed prairie dog	*Cynomys leucurus*	Natural Heritage Data (DATA GAP); SWReGAP Distribution Model	Tbd
Black-footed ferret	*Mustela nigripes*	Natural Heritage Data (DATA GAP); SWReGAP Distribution Model	Tbd
Greater sage-grouse	*Centrocercus urophasianus*	Natural Heritage Data (DATA GAP); SWReGAP Distribution Model	Tbd
Mule deer	*Odocoileus hemionus*	Natural Heritage Data (DATA GAP); SWReGAP Distribution Model ; Mule Deer Covers – Class A; Mule Deer Covers – Class B; Mule Deer Covers – Class C; Mule Deer Covers – Class D; Mule Deer Covers – Class E; Mule Deer Covers – Class F; US Mule Deer Cover; New Mexico Mule Deer Cover;	Tbd
Mexican spotted owl	*Strix occidentalis lucida*	Natural Heritage Data (DATA GAP); SWReGAP Distribution Model	Tbd
Pronghorn	*Antilocapra americana*	Natural Heritage Data (DATA GAP); SWReGAP Distribution Model	Tbd
Wild horses & burros		BLM_FEATURE_RANGELAND (BLM range allotments and pastures, **Wild horse and burro herd areas and herd management areas**, USFS range allotments)*	Tbd

*http://www.blm.gov/nils/GeoComm/home_services.html

Table 17. Tentative DATA GAPS for FINE-FILTER plant species associated with dominant Ecological Systems of the Colorado Plateau.

SPECIES	SCIENTIFIC NAME	IDENTIFIED DATA	EVALUATION
Pinyon Pine	*Pinus edulis*	PinyonPine_PIEDRangeMap.zip	Tbd
Wyoming Big Sagebrush	*Artemisia tridentata wyomingensis*	Sagebrush_SPP_artetrid.zip; (no subspecies distr)	Tbd
Mountain Sagebrush	*Artemisia tridentata ssp. vaseyana*	Sagebrush_SPP_artetrid.zip; (no subspecies distr)	Tbd
Littleleaf Mountain Mahogany	*Cercocarpus intricatus*	DATA GAP	DATA GAP
Gambel Oak	*Quercus gambelii*	Gambel_Oak_quergamb.zip	Tbd
Utah Juniper	*Juniperus osteosperma*	Utah_Juniper_unioste.zip	Tbd
Blackbrush	*Coleogyne ramosissima*	DATA GAP	DATA GAP
Shadscale	*Atriplex confertifolia*	DATA GAP	DATA GAP

Table 18. Tentative DATA GAPS for SITES of Conservation Concern Conservation Elements (Colorado Plateau Ecoregion).

SITE CLASSES	IDENTIFIED DATA	EVALUATION
Terrestrial Sites of High Biodiversity:		
TNC portfolio sites	http://www.conserveonline.org/workspaces/rmcr.gis	Tbd
NatureServe/Natural Heritage sites		
Important bird areas (Audubon)	NABBS 2003 - Version 2004.1 (Clip COP, SOD); RMBO - point transects 1998 to 2009; BBS Grid: Bird Breeding Survey, Bird Counts, Bird Occurances (COP, SOD CLIP); http://www.pwrc.usgs.gov/bbs/geographic_information /geographic_information_products.htm;	Tbd
Areas recognized by Partners-In-Flight	Partners_In_Flight_BCRfinalg.zip; Partners_In_Flight_Projection_File_geo2lamaz_na.txt	Tbd
Areas recognized by State Wildlife Action Plans	Arizona_Wildlife_linksages_GIS_Layers.zip; Utah_GDB_Bioscience_DNRStateWildlifeSctionPlan.zip ; Utah_SDIG93_Bioscience_DNRStateWildlifeActionPlan.zip; Utah_SDIG93_Bioscience_DNRStateWildlifeActionPlan.txt; http://fws-case-12.nmsu.edu/cwcs/sortspatialdata.php; http://ndis.nrel.colostate.edu/ftp/ftp_response.asp;	Tbd
Terrestrial Sites of High Ecological and/or Cultural Value:		
Historic and Nationally Designated Trails	HistoricTrails, PonyExpress; NFS_Lands_Trails.zip; Public_Lands_Trails.zip;	Tbd
Wilderness Areas		
Wilderness Study Areas		
Historic Districts		
National Wildlife Refuges	NFS_Lands_NWRs.zip; Public_Lands_NWRs.zip	Tbd
Monuments	NFS_Lands_NMs.zip; Public_Lands_NM.zip	Tbd
National and State Parks	National_Parks.zip	Tbd
NCAs ACECs	Public_Lands_NCAs.zip Public_Lands_ACECs.zip	Tbd
Forest Service Research Natural Areas	Copy of R2 RNA.xls; Copy of R3 RNA.xls; Copy of R4 RNA.xls	Tbd

Table 18. (Continued) Tentative DATA GAPS for SITES of Conservation Concern Conservation Elements (Colorado Plateau Ecoregion).

SITE CLASSES	IDENTIFIED DATA	EVALUATION
State Wildlife Management Areas		
Suitable Wild and Scenic Rivers	NFS_Lands_WSRs.zip; Public_Lands_WSRs.zip	Tbd
Designated Recreation Management Areas	NFS_Lands_NRAs.zip; Public_Lands_NRAs.zip	Tbd
Sensitive Air Quality and Smoke Impact Receptors	FWSCLASSI_Final.zip npsClassI_Receptors_20071119.zip Receptors_ClassIData.zip Receptors_ConvertClassI.zip usfsC1_Receptors_Final.zip	Tbd
Aquatic Sites of High Biodiversity:		
TNC portfolio sites NatureServe/Natural Heritage sites	http://www.conserveonline.org/workspaces/rmcr.gis	Tbd
Areas recognized by State Wildlife Action Plans		DATA GAP
EMAP-West Reference Sites (USEPA)	EMAP-WEST_Siteinfo.csv, EMAP-WEST_Siteinfo.pdf, other associated datasets	Tbd

Table 19. Tentative DATA GAPS for FUNCTIONS & SERVICES of Conservation Concern as Conservation Elements selected for the Colorado Plateau Ecoregion.

SITE CLASSES	IDENTIFIED DATA	EVALUATION
Terrestrial Functions of High Ecological Value:		
Soil stability	National Soil Information System (NASIS) - General Soils Map STATSGO2; emap –west_huc8slmetrics.zip (various, RUSLE , saline soils, wind erodability, many others);	Tbd
Forage	National Soil Information System (NASIS) - General Soils Map STATSGO2; emap –west_huc8slmetrics.zip	Tbd
Surface and Subsurface Water Availability:		
Aquatic systems of streams, lakes, ponds, etc.	National Hydrography Dataset(NHD Model; Coverage 'hydroply' US Atlas of water features NHD 1:24,000; Washes: http:://agic.az.gov/ portal/ dataList.do?sort=theme&dataset=362); Watershed Boundary Datasets (WBD);	Tbd
Springs/seeps/wetlands	Spring Locations, Springs – NHD (AZ); SpringsNHDHighRes, Wetlands (UT); NWI - Utah - Wetland Polygon Info.; NWI - Colorado - Wetland Polygon Info.; NWI - Arizona - Wetland Polygon Info.; NWI – New Mexico - Wetland Polygon Info.; Springs (USGS-NWIS UT, CO, AZ, NM)	Tbd
Riparian areas	azriparian.e00.zip; riparian areas (http://ndis.nrel.colostate.edu/ftp/ftp_response.asp);	Tbd
High quality and impaired waters	303 (d) Listed Impaired Waters NHD Indexed Dataset; NWIS (http://waterdata.usgs.gov/nwis);	tbd
Groundwater protection zones, sole source aquifers	Groundwater Climate Response Network; SGID93.Geoscience.Aquifer_BasinFillBoundary (UT); SGID93.Geoscience.Aquifer_RechargeDischargeAreas (UT); aquifer.zip (CO); Aquifer_BasinFillBoundary (UT); Aquifer_RechargeDischargeAreas (UT); aquifers (nationalatlas.gov); aquifers (USEPA); aquifers (CO); sole source aquifers (USEPA);	Tbd

Table 20. Tentative DATA GAPS for CHANGE AGENTS for the Colorado Plateau Ecoregion.

CHANGE AGENTS	IDENTIFIED DATA	EVALUATION
Wildland Fire	LANDFIFE EVT, BpS, others to represent departure; Human Caused Fire Density in the Western United States (1986 – 2001)[SAGEMAP}; Burn Severity Image Mosaics (PAC SW, SW); MTBS Fire Occurrence Shapefile (Clipped to CP); MTBS Fire Perimeter Shapefile – Clipped to CP); Wildland Urban Interface Shapefile); Burn Severity (mtbs.gov); Fire Occurrence (mtbs.gov); Fire Perimeters (mtbs.gov); GeoMac 2009 fire data); Lightning Strikes (gcmd,nasa.gov);	Tbd
Invasive Species	Infestation Location (NISIMS); Survey Area (NISIMS); Treatment Boundaries (NISIMS); Weed Management Areas (NISIMS); Exotic Plant Invasion Risk in the Western United States (SAGEMAP); NIISS_CheatgrassOoccurrences.csv; NIISS_TamariskOccurrences.csv; Cooperative_Weed_Management_AreasCWMABoundaries2007_072307.zip; SWEMP2007_final.zip;	Tbd
Land and Resource Use	Grazing Allotments; NFS_Lands_NRAs.zip; Public_Lands_NRAs.zip; LANDFIRE EVT & BpS; BLM Herd Areas (HAs); BLM Herd Management Areas HMSs); Historic Trails, Poney Express (Utah); NFS_Lands_Trails.zip; Public_Lands_Trails.zip; BLM_FEATURE_RANGELAND (BLM range allotments and pastures, Wild horse and burro herd and herd management areas, USFS allotments); BLM_MAP_RANGELAND; BLM_SITES (Abandoned mines (from many agencies), BLM recreation sites, BLM campgrounds, BLM buildings, BLM administration sites, BLM bridges, and BLM dams); BLM_MAP_CASE; NFS_Lands_WSRs.zip; GIS Hunting Data: Habitat, Endangered Species Boundaries, & Misc. data (Utah);	Tbd
Urban and Roads Development	(SEE HUMAN FOOTPRINT – APPENDIX	
Oil, Gas, and Mining Development	(SEE ASSOCIATED SPREADSHEET)	

Table 20. (Continued) Tentative DATA GAPS for CHANGE AGENTS for the Colorado Plateau Ecoregion.

CHANGE AGENTS	IDENTIFIED DATA	EVALUATION
Renewable Energy Development (i.e., solar, wind, geothermal, including transmission corridors)	(SEE ASSOCIATED SPREADSHEET)	
Agriculture	(SEE ASSOCIATED SPREADSHEET)	
Livestock grazing (proposed by Dynamac)	Grazing Allotments; LANDFIRE EVT & BpS; BLM Herd Areas (HAs); BLM Herd Management Areas HMSs); BLM_FEATURE_RANGELAND (BLM range allotments and pastures, Wild horse and burro herd and herd management areas, USFS allotments); BLM_MAP_RANGELAND; BLM_MAP_CASE; MODIS EVI data	Tbd
Wild horse and burro grazing (proposed by AMT)	BLM Herd Areas (HAs); BLM Herd Management Areas HMSs); BLM_FEATURE_RANGELAND (BLM range allotments and pastures, Wild horse and burro herd and herd management areas, USFS allotments); BLM_MAP_RANGELAND; MODIS EVI data	Tbd
Wildlife grazing (proposed by AMT)	DATA GAP	DATA GAP
Groundwater and Surface Water Extraction, Development, and Transportation	Locations of wells & data (NWIS); Aquifers of the 48 Conterminous US States; Groundwater Climate Response Network; SGID93.Geoscience.Aquifer_BasinFillBoundary; SGID93.Geoscience.Aquifer_RechargeDischargeAreas; Sole Source Aquifers (USEPA); Aquifers(nationalatlas.gov); Aquifers(epa.gov); Aquifers(water.state.co.us); riparian areas (ndis.nrel.colostate.edu); NWI; NHD; SpringsNHDHighRes, Wetlands(Utah.gov); Spring Locations, Springs – NHD (agic.az.gov); Estimated use of water in the United States by County; Watershed Boundary Datasets (WBD); Coverage 'hydroply' US Atlas of water features; 303 (d) Listed Impaired Waters NHD Indexed Dataset; azriparian.e00.zip;	Tbd

5.2 Data Gaps by Management Question Group

Table 21. Tentative DATA GAPS associated with management questions related to SOILS, BIOLOGICAL CRUSTS, and FORAGE as conservation elements.

SOILS. BIOLOGICAL CRUSTS, FORAGE MANAGEMENT QUESTIONS

- *Where are soils susceptible to wind and water erosion?*
- *Where are soils with the potential to change from high wind erosion/dust/dunes likely to develop due to climate change or groundwater withdrawal?*
- *Where are sensitive (saline) soils?*
- *Where are the areas of important forage production for livestock, wild horses and burros, and wildlife located?*
- *What is the potential for future change to forage production from change agents?*
- *Where are soils that have or have potential to have cryptogamic soil crusts?*
- *Where are these intact cryptogamic crusts located?*
- *What/where is the potential for future change to the cryptogamic crusts?*
- *Where are areas producing fugitive dust that may contribute to accelerated snow melt in the Colorado*

TENTATIVE DATA NEEDS	DATA CLASS	STATUS
Ownership	ADMINSITRATIVE	YES
PRISM	CLIMATE	YES
DAYMET	CLIMATE	YES
Future Climate Change Scenario	CLIMATE	YES
Winds	CLIMATE	DATA GAP
Human footprint variables (including areas of probable future energy development)	DEVELOPMENT	YES
Grazing Allotments	GRAZING	YES
Herd Areas (HAs)	GRAZING	YES
Herd Management Areas (HMAs)	GRAZING	YES
Ranches & farms	GRAZING	TBD
Agricultural census data	GRAZING	YES
AU densities	GRAZING	tbd
Modeled wild horse habitat usage	GRAZING	TBD
Modeled burro habitat usage	GRAZING	TBD
Groundwater Extraction Areas	GROUNDWATER	YES
Modeled wildlife habitats	HABITAT	YES

Table 21. (Continued) Tentative DATA GAPS associated with management questions related to SOILS, BIOLOGICAL CRUSTS, and FORAGE as conservation elements.

SOILS. BIOLOGICAL CRUSTS, FORAGE MANAGEMENT QUESTIONS

- *Where are soils susceptible to wind and water erosion?*
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- *Where are soils that have or have potential to have cryptogamic soil crusts?*
- *Where are these intact cryptogamic crusts located?*
- *What/where is the potential for future change to the cryptogamic crusts?*
- *Where are areas producing fugitive dust that may contribute to accelerated snow melt in the Colorado*

TENTATIVE DATA NEEDS	DATA CLASS	PROVISIONAL STATUS
Mapped distribution of non-native plants of forage value	INVASIVES	DATA GAP
Risk of invasive species	INVASIVES	TBD
OHV use areas and vulnerable areas	RESOURCE USE	YES
PFC data if available	RIPARIAN CONDITION	DATA GAP
STATSGO2	SOILS	YES
SSURGO	SOILS	TBD
Sensitive Soils layer	SOILS	YES
Surficial geology	SOILS	TBD
Sampled soil crust location data (Bowker et al. 2008)	SOILS	TBD
NHD	SURFACE WATER	YES
Other available surface water sources	SURFACE WATER	YES
Wildlife and stock tanks and guzzler locations	SURFACE WATER	DATA GAP
DEM (NED)	TOPOGRAPHY	YES
Rangeland Condition Assessments if available	UPLAND CONDITION	DATA GAP
LANDFIRE EVT	VEGETATION	YES
LANDFIRE BpS	VEGETATION	YES
LANDFIRE Canopy Closure	VEGETATION	YES
Forage availability (multi-date MODIS EVI)	VEGETATION	TBD
Water quality status	WATER QUALITY	YES
Fire risk	WILDFIRE	TBD

Table 22. Tentative DATA GAPS associated with management questions related to SURFACE and GROUNDWATER as conservation elements.

SURFACE AND GROUNDWATER MANAGEMENT QUESTIONS

- *Where are the surface waterbodies and livestock and wildlife watering tanks?*
- *What is the persistence of the flow (e.g., perennial, ephemeral) of these systems?*
- *Which surface waters are likely dependent on seasonal precipitation, and what are the characteristics of their current seasonal flows?*
- *Where are the aquifers and their recharge areas?*
- *Which surface waters are likely dependent on groundwater to maintain their ecological condition?*
- *What is the condition of these various aquatic systems defined by PFC?*
- *Where are the degraded aquatic systems (e.g., water quality)?*
- *What is the location/distribution of these (aquatic) sites?*
- *What/Where is the potential for future change to these (aquatic) high biodiversity sites in the near-term, 2025 (development), and long-term, 2060 (climate change)?*
- *Where are the areas of high and low groundwater potential?*
- *Where are the areas showing effects from existing groundwater extraction?*
- *Where are artificial water bodies, including evaporation ponds, etc.?*

TENTATIVE DATA NEED	DATA CLASS	PROVISIONAL STATUS
DAYMET	CLIMATE - CURRENT	YES
PRISM	CLIMATE - CURRENT	YES
Future climate data (2060 climate change scenario data)	CLIMATE - FUTURE	YES
Aquifer locations	GROUND WATER	YES
Monitored deep well locations and longitudinal flow data	GROUND WATER	YES
Ground water extraction areas	GROUND WATER	YES
Wild and Scenic Rivers	SITES OF CONSERVATION CONCERN	YES
Aquatic sites of conservation concern	SITES OF CONSERVATION CONCERN	YES
Surficial geology,	SOILS/GEOLOGY	TBD
STATSGO2	SOILS/GEOLOGY	YES
SSURGO,	SOILS/GEOLOGY	TBD
EO's of Aquatics	SPECIES CONSERVATION ELEMENTS	POTENTIAL DATA GAP
NHD	SURFACE WATER	YES
Guzzler Locations if available	SURFACE WATER	DATA GAP
EMAP-West field data stream flow status observations	SURFACE WATER	YES
Stream gage data	SURFACE WATER	YES
NWI	SURFACE WATER	YES
Watershed boundaries	SURFACE WATER	YES

Table 22 (Continued…). Tentative DATA GAPS associated with management questions related to SURFACE and GROUNDWATER as conservation elements.

SURFACE AND GROUNDWATER MANAGEMENT QUESTIONS

- *Where are the surface waterbodies and livestock and wildlife watering tanks?*
- *What is the persistence of the flow (e.g., perennial, ephemeral) of these systems?*
- *Which surface waters are likely dependent on seasonal precipitation, and what are the characteristics of their current seasonal flows?*
- *Where are the aquifers and their recharge areas?*
- *Which surface waters are likely dependent on groundwater to maintain their ecological condition?*
- *What is the condition of these various aquatic systems defined by PFC?*
- *Where are the degraded aquatic systems (e.g., water quality)?*
- *What is the location/distribution of these(aquatic) sites?*
- *What/Where is the potential for future change to these (aquatic) high biodiversity sites in the near-term, 2025 (development), and long-term, 2060 (climate change)?*
- *Where are the areas of high and low groundwater potential?*
- *Where are the areas showing effects from existing groundwater extraction?*
- *Where are artificial water bodies, including evaporation ponds, etc.?*

TENTATIVE DATA NEED	DATA CLASS	PROVISIONAL STATUS
Spring locations	SURFACE WATER	YES
Bureau of Reclamation flow change projection data	SURFACE WATER	TBD
Artificial water bodies	SURFACE WATER	YES
DEM (NED)	TOPOGRAPHY	YES
LANDFIRE BpS & EVT	VEGETATION	YES
303 (d) streams	WATER QUALITY	YES
NLCD	WATERSHED DISTURBANCE	YES
TIGER roads	WATERSHED DISTURBANCE	YES
RUSLE Metric layer (EMAP-WEST)	WATERSHED DISTURBANCE	YES
Other EMAP-WEST Landscape Condition Metrics	WATERSHED DISTURBANCE	YES
Current land cover and human footprint layers	WATERSHED DISTURBANCE	YES
Areas of planned or projected growth and development (including dam construction)	WATERSHED DISTURBANCE	YES

Table 23. Tentative DATA GAPS associated with management questions related to ECOLOGICAL SYSTEMS as conservation elements.

ECOLOGICAL SYSTEM MANAGEMENT QUESTIONS

- *Where are these intact vegetative communities located?*
- *What/where is the potential for future change to the community?*

TENTATIVE DATA NEEDS	DATA CLASS	PROVISIONAL STATUS
Current climate bioclimatic variables - PRISM or DAYMET	CLIMATE - CURRENT	YES
Bioclimatic variables derived - 2060 climate scenario data	CLIMATE - FUTURE	YES
TIGER	HUMAN FOOTPRINT	YES
ESRI Roads	HUMAN FOOTPRINT	YES
NLCD	LANDCOVER/LAND USE	YES
Distribution of a dominant, characteristic plant species representative of the Ecological System	PLANT SPECIES OCCURRENCE DATA	PARTIAL DATA GAP
STATSGO2	SOILS/GEOLOGY	YES
SSURGO,	SOILS/GEOLOGY	TBD
Surficial geology	SOILS/GEOLOGY	TBD
DEM (NED)	TOPOGRAPHY/ELEVATION	YES
LANDFIRE (EVT, Canopy Closure, Potential Vegetation)	VEGETATION	YES

Table 24. Tentative DATA GAPS associated with management questions related to SPECIES, habitats, and sites of high biodiversity or of conservation concern as conservation elements.

SPECIES CONSERVATION ELEMENTS MANAGEMENT QUESTIONS

- *What is the current distribution of occupied habitat, including seasonal habitat, and movement corridors?*
- *What areas known to have been surveyed and what areas have not been surveyed (i.e., data gap locations)?*
- *Where are change agents affecting these habitat and movement corridors?*
- *Where are habitats that may be limiting species sustainability?*
- *Where are species populations at risk?*
- *Where are potential habitat restoration areas?*
- *Where are potential areas to restore connectivity?*
- *What is the location/distribution of these (terrestrial) sites?*
- *What/where is the potential for future change to these high-biodiversity sites in the near-term horizon, 2025 (development) and a long-term change horizon, 2060 (climate change)?*
- *Where are the current wild horse and burro populations?*
- *What/where is the potential for future change to this species in the near-term horizon, 2025 (development) and a long-term horizon, 2060 (climate change)?*
- *Where are the areas of core conservation aquatic species habitat change?*
- *Where are the (Conservation/Reserve Program) areas?*

TENTATIVE DATA NEEDS	DATA CLASS	PROVISIONAL STATUS
Atmospheric Deposition	AIRBORNE POLLUTANTS	DATA GAP
USEPAs EMAP-West indicators of stream condition data and landscape disturbance data, Forest Fragmentation	AQUATIC CONDITION	YES
Current climate (PRISM, DAYMET)	CLIMATE - CURRENT	YES
Future climate (2060 downscaled climate model)	CLIMATE - FUTURE	YES
Drought	CLIMATE - RECENT	tbd
Human footprint (Development)	DEVELOPMENT	YES
Road Density	DEVELOPMENT	YES
Land use planning areas	DEVELOPMENT - FUTURE	YES
Population growth projections	DEVELOPMENT - FUTURE	DATA GAP
LANDFIRE (EVT, Canopy Closure, Potential Vegetation)	HABITAT	YES
Identified movement corridors	HABITAT	DATA GAP
Identified seasonal habitats	HABITAT	DATA GAP
Active and Abandoned Mines.	HABITAT	YES
Forest Insect and Diseases	INSECTS/DISEASE	YES
Invasive species distribution & vulnerability	INVASIVE SPECIES	YES
NLCD	LANDCOVER/LAND USE	YES
Human Footprint layers, including dam locations & water diversions	LANDCOVER/LAND USE	YES
USEPAs EMAP-West landscape metric layers	LANDSCAPE CONDITION	YES
HUC boundary file, various site lists identified in Memorandum I.1.c	LANDSCAPE REPORTING UNITS	YES
Grazing pressure	RESOURCE USE	TBD

Table 24. (Continued) Tentative DATA GAPS associated with management questions related to SPECIES, habitats, and sites of high biodiversity or of conservation concern as conservation elements.

SPECIES CONSERVATION ELEMENTS MANAGEMENT QUESTIONS

- *What is the current distribution of occupied habitat, including seasonal habitat, and movement corridors?*
- *What areas known to have been surveyed and what areas have not been surveyed (i.e., data gap locations)?*
- *Where are change agents affecting these habitat and movement corridors?*
- *Where are habitats that may be limiting species sustainability?*
- *Where are species populations at risk?*
- *Where are potential habitat restoration areas?*
- *Where are potential areas to restore connectivity?*
- *What is the location/distribution of these (terrestrial) sites?*
- *What/where is the potential for future change to these high-biodiversity sites in the near-term horizon, 2020 (development) and a long-term change horizon, 2060 (climate change)?*
- *Where are the current wild horse and burro populations?*
- *What/where is the potential for future change to this species in the near-term horizon, 2020 (development) and a long-term horizon, 2060 (climate change)?*
- *Where are the areas of core conservation aquatic species habitat change?*
- *Where are the (Conservation/Reserve Program) areas?*

TENTATIVE DATA NEEDS	DATA CLASS	PROVISIONAL STATUS
Forest Management (Logging, control fire)	RESOURCE USE	DATA GAP
STATSGO2	SOILS	YES
Biological Significance Ranking (NHP) for species conservation elements.	SPECIES - ANCILLARY	DATA GAP
Herd Areas (HA) data layer	SPECIES CONSERVATION ELEMENT	YES
Herd Management (HMA) data layer	SPECIES CONSERVATION ELEMENT	YES
Wild horse and burro population data	SPECIES CONSERVATION ELEMENT	DATA GAP
Aquatic species occurrence data (event data for NHD traces)	SPECIES CONSERVATION ELEMENT	YES
NHP EO's	SPECIES OCCURRENCES	DATA GAP
NHD	SURFACE WATER	YES
Spring, Seeps	SURFACE WATER	YES
Topographic position	TOPOGRAPHY/ELEVATION	YES
Fire regime	WILDFIRE	YES
Mapped Conservation/Reserve Program areas.	CRP AREAS	DATA GAP
Surficial geology	SOILS/GEOLOGY	TBD

Table 25. Tentative DATA GAPS associated with management questions related to WILDFIRE as a change agent.

WILDFIRE MANAGEMENT QUESTIONS

- *Where are the areas that have been changed by wildfire between 1999 and 2009?*
- *Where are the areas with potential to change from wildfire?*
- *Where are the Fire Regime Condition Classifications?*
- *Where are collaborative strategic prevention actions taking place?*
- *Where is fire adverse to ecological communities, features, and resources of concern?*

TENTATIVE DATA NEEDS	DATA CLASS	PROVISIONAL STATUS
Current climate (PRISM, DAYMET).	CLIMATE - CURRENT	YES
Sites of ecological concern	CONSERVATION ELEMENTS	YES
Designated viewsheds	CONSERVATION ELEMENTS	YES
Lighting strike density layer	IGNITION RISK	YES
Human-caused fire layer	IGNITION RISK	YES
Areas where risk of invasive species establishment is high following fire	INVASIVE SPECIES	TBD
LANDFIRE (EVT, Canopy Closure, Potential Vegetation, Biophysical Setting, Regime Condition Class, Historical Fire Regime Groups, and Fire Succession Classes)	VEGETATION	YES
Fire History (1999 – 2009)	WILDFIRE	YES
Fire boundary maps	WILDFIRE	YES
Fire severity maps.	WILDFIRE	YES
LANDFIRE (Fire Regime Departure of Condition class)	WILDFIRE	YES
LANDFIRE (Mean Fire Return Interval)	WILDFIRE	YES
LANDFIRE (Simulated Historical percent of Low, Mixed and Replacement Fires)	WILDFIRE	YES
Wildland Urban Interface (WUI)	WILDFIRE MANAGEMENT	YES
County, State, and Federal fire prevention action plans.	WILDFIRE MANAGEMENT	DATA GAP

Table 26. Tentative DATA GAPS associated with management questions related to INVASIVE SPECIES as change agents.

INVASIVE SPECIES MANAGEMENT QUESTIONS

- *Where are areas dominated by this invasive species?*
- *Where are the areas of potential future encroachment from this invasive species?*
- *Where are areas of suitable biophysical setting (precipitation/soils, etc.) with restoration potential?*

TENTATIVE DATA NEED	DATA CLASS	PROVISIONAL STATUS
Current climate (PRISM, DAYMET)	CLIMATE-CURRENT	YES
2060 downscaled climate change data	CLIMATE-FUTURE	YES
human footprint layers	HUMAN FOOTPRINT	YES
Road density	HUMAN FOOTPRINT	YES
Invasive species occurrence data	INVASIVE SPP OCCURRENCE	PARTIAL GAP
STATSGO2	SOILS	YES
SSURGO	SOILS	TBD
NHD	SURFACE WATER	YES
DEM	TOPOGRAPHY/ELEVATION	YES
LANDFIRE (EVT, Canopy Closure, Potential Vegetation, Historical Fire Regime Groups)	VEGETATION	YES
Multi-date MODIS EVI.	VEGETATION	TBD
LANDFIRE (Fire Regime Departure of Condition class), LANDFIRE (Mean Fire Return Interval), LANDFIRE (Simulated Historical percent of Low, Mixed and Replacement Fires)	WILDFIRE	YES
Recently burned areas	WILDFIRE	YES

Table 27. Tentative DATA GAPS associated with management questions related to FUTURE DEVELOPMENT as a change agent. For CURRENT DEVELOPMENT– see APPENDIX (11).

DEVELOPMENT-RELATED MANAGEMENT QUESTIONS

- *Where are areas of planned development (e.g., plans of operation, governmental planning)?*
- *Where are areas of potential development (e.g., under lease), including sites and transmission corridors?*
- *Where are the surface waters that might be vulnerable to flow reduction as a result of groundwater extraction?*

TENTATIVE DATA NEED	DATA CLASS	PROVISIONAL STATUS
Identified transmission corridors	DEVELOPMENT	YES
Leased oil & gas areas	DEVELOPMENT	YES
Leased renewable energy sites	DEVELOPMENT	YES
Roads	DEVELOPMENT	YES
City, County, State, and Federal Development Plans (Current and Potential)	DEVELOPMENT-FUTURE	DATA GAP
Mapped conventional energy development areas	DEVELOPMENT-FUTURE	YES
Mapped renewable energy suitability areas.	DEVELOPMENT-FUTURE	YES
Ground Water Extraction Areas	DEVELOP-GROUNDWATER	YES
Monitored wells and longitudinal flow data	DEVELOP-GROUNDWATER	YES
Aquifer locations.	DEVELOP-GROUNDWATER	YES
NLCD	LANDCOVER/LAND USE	YES
STATSGO2	SOILS	YES
SSURGO	SOILS	YES
NHD (perennial & possibly intermittent flow classifications)	SURFACE WATER	YES
NWI	SURFACE WATER	YES
DEM (NED)	TOPOGRAPHY/ELEVATION	YES

Table 28. Tentative DATA GAPS associated with management questions related to various RESOURCE USES as change agents.

RESOURCE USE MANAGEMENT QUESTIONS

- *Where are high-use recreation sites, developments, infrastructure or areas of intensive recreation use located (including boating)?*
- *Where are areas of concentrated recreation travel located (OHV and other travel)?*
- *Where are permitted areas of intensive recreation use (permit issued)?*
- *What are planned areas for disposal that may cause change of Federal ownership?*
- *Where does/has grazing occur/occurred?*
- *Where/How has grazing impacted the current status of conservation elements?*
- *Where/How may grazing impact the potential future status of conservation elements?*

TENTATIVE DATA NEED	DATA CLASS	PROVISIONAL STATUS
Administrative boundaries.	ADMINISTRATIVE BOUNDARIES	YES
Planned Disposal Sites	ADMINISTRATIVE BOUNDARIES	YES
PRISM	CLIMATE - CURRENT	YES
DAYMET	CLIMATE - CURRENT	YES
NLCD	LANDCOVER/LAND USE	YES
Detailed roads data	RESOURCE ACCESS	YES
Areas of higher forage availability (MODIS EVI)	RESOURCE AVAILABILITY	TBD
Modeled wildlife habitats	RESOURCE CONDITION	YES
Water quality status	RESOURCE CONDITION	YES
PFC data if available	RESOURCE CONDITION	DATA GAP
Rangeland Condition Assessments if available	RESOURCE CONDITION	DATA GAP
Urban Areas	RESOURCE PRESSURES	YES
Agricultural census data.	RESOURCE PRESSURES	YES
AU densities and timing	RESOURCE PRESSURES	DATA GAP
Recreation management areas and infrastructure	RESOURCE USE AREAS	YES
Permitted use areas	RESOURCE USE AREAS	YES
OHV use areas	RESOURCE USE AREAS	DATA GAP
Permitted use areas	RESOURCE USE AREAS	YES
Recreational Sites	RESOURCE USE AREAS	YES
Grazing Allotments	RESOURCE USE AREAS	YES
Ranches/farms	RESOURCE USE AREAS	TBD
STATSGO2	SOILS	YES
Sensitive Soils layer	SOILS	YES
NHD	SURFACE WATER	YES
Other surface water sources	SURFACE WATER	YES
Wildlife and stock tanks and guzzlers	SURFACE WATER	DATA GAP
Lakes database	SURFACE WATER	YES
DEM (NED)	TOPOGRAPHY/ELEVATION	YES
LANDFIRE EVT & BpS	VEGETATION	YES

Table 29. Tentative DATA GAPS associated with management questions related to AIR QUALITY.

AIR QUALITY MANAGEMENT QUESTIONS

- *Where are the viewsheds adjacent to scenic conservation areas?*
- *Where are the viewsheds most vulnerable to change agents?*
- *Where are the designated non-attainment areas and Class I PSD areas?*

TENTATIVE DATA NEED	DATA CLASS	PROVISIONAL STATUS
Non-attainment areas	AIR QUALITY	YES
Relevant Human Footprint components (e.g., energy development areas)	CHANGE AGENTS	YES
PRISM	CLIMATE-CURRENT	YES
DAYMET	CLIMATE-CURRENT	YES
LANDFIRE	VEGETATION	YES
Scenic Conservation Areas	VIEWS	TBD
Designated Viewsheds database	VIEWSHEDS	YES

Table 30. Tentative DATA GAPS associated with management questions related to CLIMATE as a change agent.

CLIMATE CHANGE MANAGEMENT QUESTIONS

- *Where/how will the distribution of dominant native plant species and invasive species change from climate change?*
- *Where are areas of potential for fragmentation as a result of climate change in 2060?*
- *Where are areas of core conservation species change as a result of climate change?*
- *Where are aquatic/riparian areas with potential to change from climate change?*

TENTATIVE DATA NEED	DATA CLASS	PROVISIONAL STATUS
PRISM	CLIMATE-CURRENT	YES
DAYMET	CLIMATE-CURRENT	YES
Downscaled 2060 climate data	CLIMATE-FUTURE	YES
Aridity index	CLIMATE-STRESS	TBD
Human footprint (current and forecast)	HUMAN FOOTPRINT	YES
Native dominant plant species (characteristic of specific Ecological Systems) occurrence data or current distribution map	PLANT SPECIES OCCURRENCES	PARTIAL GAP
STATSGO2	SOILS	YES
SSURGO	SOILS	TBD
NHD	SURFACE WATER	YES
NWI	SURFACE WATER	YES
NED	TOPOGRAPHY/ELEVATION	YES
LANDFIRE EVT & BpS, Reference Fire Regimes	VEGETATION	YES

VI. DISCUSSION

The intention of Task I-2 was to identify and evaluate all of the data needed for this REA. The linear nature of tasks and deliverables complicated the data search, since the data that will be required is largely dependent on the methods to be used and methods will not be identified and approved until Task I-3. The selection of a final set of useful data layers to address the various classes of management questions was delayed by the huge number of available datasets. Including the required and recommended datasets listed by BLM, we have accumulated several hundred candidate data layers. Ideally, each data layer should be opened, inspected, and evaluated according to 11 quality criteria to choose the ones with the highest confidence scores. The Dynamac team found the evaluation process to be very time-consuming. The process was complicated by the redundancy in data layers. For example, there are approximately 50 data layers in the category of energy development alone. Which ones are the best to use? Many additional promising data layers were suggested by the participants in Workshop 2 and they remain to be incorporated and evaluated.

As a result of the challenges described, it became apparent that completion of the data identification and evaluation step was not realistic within the time and level-of-effort constraints inherent to the REA process. As a result, the AMT agreed to extend the data identification and evaluation stage through Phase 3 and 4 of the REA and to delay the formal evaluation of data layers until they were formally accepted for the modeling effort.

Memo I-2-a therefore represents a status report of data evaluations conducted through 18 October, 2010. A lesson learned from these early REAs might be for BLM to fund a sub-assessment to have groups of similarly-themed data layers evaluated to choose the best ones and then provide the best of the basic layers, such as energy development or agriculture, in the required or recommended list.

Attribution Accuracy

A common theme at both workshops was the accuracy of the major vegetation data layers, SW ReGAP and LANDFIRE. The Dynamac team showed an example of the differences in extent and attribution of various riparian vegetation classes for the same location. Some workshop participants were strongly in favor of using the GAP data, which they considered more accurate. Fire specialists naturally preferred LANDFIRE for fire related questions. The possible solutions are 1) to use SW ReGAP for all vegetation questions and LANDFIRE for fire-related questions with the risk of having incomparable results or 2) perform a cross-walk between SW ReGAP and LANDFIRE. The crosswalk would require rewriting the code for LANDFIRE using biophysical information from SW ReGAP. This would presumably be far too time-consuming to be accomplished within the REA framework. This issue is extremely important to resolve, as it will influence our proposed approaches, methods, and tools, as well as time estimates for Task I-3 related to ecological systems, fire, invasive species, and species habitat mapping.

Other attribution issues involve the accuracy of large nationwide data layers and our need to use them without alteration. The National Hydrography Dataset (NHD) is a basic required data layer that we will use for the REA. The NHD is a full-coverage digital data layer representing surface water features of the United States. A set of embedded attributes provides specialized information such as stream network or flow direction and links to related data such as discharge, habitat, or fish data. Because of its complexity, there are errors in the NHD. For example, in areas dense with canals crossing natural stream channels, we have experienced flow arrows pointing at each other or pointing

uphill. The possibility of these errors influencing the outcome of the REA must be noted, although the SOW specifies that we are not to correct errors in data layers because of time limitations.

Data at Multiple Scales

One of the biggest challenges in the REA besides the sheer number of datasets will be the range in scale of the various data layers, ranging from coarse climate data interpolated onto a15 km grid to 30m resolution raster data to species occurrence data that may be spatially explicit or generalized. Limitations in the ability to overlay disparate data will influence the kinds of questions we will be able to answer. Many of the management questions are very specific, but the available data may not be specific enough to answer some questions.

Registration Errors

Overlaying different data layers from various sources may expose differences in registration. For example, when examining riparian vegetation as habitat, corridor, or to assess condition, it will be necessary to overlay the NHD dataset with a layer depicting vegetation, such as Landfire. We may want to buffer stream networks to calculate what proportion of stream miles contains riparian vegetation. There will be cases where the registration will be off and the stream blue line and areas of riparian vegetation will not match.

Incorporating Assumptions into Spatially Explicit Answers

Three quarters of the data layers found so far relate to human impacts, meaning there will be plenty of available data to conduct human footprint and vulnerability assessments. The process becomes more complex when it comes to treating change over several future timeframes. The data to assess the current human footprint is spatially explicit; however, it will be difficult to derive spatially explicit answers to management questions concerning future scenarios. For example, we know that road density will increase in the future, but we cannot know the future locations of those roads. Future scenarios will have to incorporate assumptions about fire frequency, patch size distribution, fragmentation of habitat, and the disappearance of wildlife corridors.

APPENDIX 1. Coarse-Filter Ecological System Selections

APPENDIX 1. Coarse Filter Ecological System Conservation Elements for the Colorado Plateau.

FOREST & WOODLAND CLASSES (31.2%)

Percent of Ecoregion	Code	Ecological System
3.13%	S023	Rocky Mountain Aspen Forest and Woodland
0.01%	S024	Rocky Mountain Bigtooth Maple Ravine Woodland
0.00%	S025	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland
1.50%	S028	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland
0.66%	S030	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland
0.47%	S031	Rocky Mountain Lodgepole Pine Forest
0.85%	S032	Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland
0.61%	S034	Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland
2.55%	S036	Rocky Mountain Ponderosa Pine Woodland
0.01%	S038	Southern Rocky Mountain Pinyon-Juniper Woodland
20.39%	S039	Colorado Plateau Pinyon-Juniper Woodland
0.35%	S040	Great Basin Pinyon-Juniper Woodland
0.67%	S042	Inter-Mountain West Aspen-Mixed Conifer Forest and Woodland Complex

APPENDIX 1 (Continued) Coarse Filter Ecological System Conservation Elements for the Colorado Plateau .

SHRUB / SCRUB CLASSES (37.3%)

Percent of Ecoregion	Code	Ecological System
0.04%	S043	Rocky Mountain Alpine Dwarf-Shrubland
2.03%	S045	Inter-Mountain Basins Mat Saltbush Shrubland
4.49%	S046	Rocky Mountain Gambel Oak-Mixed Montane Shrubland
0.66%	S047	Rocky Mountain Lower Montane-Foothill Shrubland
0.02%	S050	Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland
6.34%	S052	Colorado Plateau Pinyon-Juniper Shrubland
9.14%	S054	Inter-Mountain Basins Big Sagebrush Shrubland
0.00%	S055	Great Basin Xeric Mixed Sagebrush Shrubland
0.68%	S056	Colorado Plateau Mixed Low Sagebrush Shrubland
0.19%	S057	Mogollon Chaparral
6.32%	S059	Colorado Plateau Blackbrush-Mormon-tea Shrubland
0.13%	S060	Mojave Mid-Elevation Mixed Desert Scrub
5.37%	S065	Inter-Mountain Basins Mixed Salt Desert Scrub
0.23%	S069	Sonora-Mojave Creosotebush-White Bursage Desert Scrub
0.00%	S070	Sonora-Mojave Mixed Salt Desert Scrub
0.01%	S128	Wyoming Basins Low Sagebrush Shrubland
1.06%	S136	Southern Colorado Plateau Sand Shrubland

APPENDIX 1 (Continued) Coarse Filter Ecological System Conservation Elements for the Colorado Plateau.

GRASSLANDS (9.1%)

Percent of Ecoregion	Code	Ecological System
0.15%	S081	Rocky Mountain Dry Tundra
0.35%	S083	Rocky Mountain Subalpine Mesic Meadow
0.26%	S085	Southern Rocky Mountain Montane-Subalpine Grassland
1.71%	S090	Inter-Mountain Basins Semi-Desert Grassland
3.91%	S071	Inter-Mountain Basins Montane Sagebrush Steppe
0.13%	S075	Inter-Mountain Basins Juniper Savanna
0.00%	S078	Inter-Mountain Basins Big Sagebrush Steppe
2.57%	S079	Inter-Mountain Basins Semi-Desert Shrub Steppe

WOODY WETLAND & RIPARIAN CLASSES (2.4%)

Percent of Ecoregion	Code	Ecological System
0.00%	S014	Inter-Mountain Basins Wash
0.00%	S020	North American Warm Desert Wash
0.11%	S091	Rocky Mountain Subalpine-Montane Riparian Shrubland
0.00%	S092	Rocky Mountain Subalpine-Montane Riparian Woodland
0.49%	S093	Rocky Mountain Lower Montane Riparian Woodland and Shrubland
0.00%	S094	North American Warm Desert Lower Montane Riparian Woodland and Shrubland
1.79%	S096	Inter-Mountain Basins Greasewood Flat
0.01%	S097	North American Warm Desert Riparian Woodland and Shrubland
0.00%	S098	North American Warm Desert Riparian Mesquite Bosque
0.00%	S118	Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland

EMERGENT HERBACEOUS WETLAND CLASSES (0.2%)

Percent of Ecoregion	Code	Ecological System
0.01%	S100	North American Arid West Emergent Marsh
0.20%	S102	Rocky Mountain Alpine-Montane Wet Meadow

APPENDIX 1 (Continued) Coarse Filter Ecological System Conservation Elements for the Colorado Plateau.

SPARSELY VEGETATED / BARREN CLASSES (13.8%)

Percent of Ecoregion	Code	Ecological System
0.00%	S001	North American Alpine Ice Field
0.35%	S002	Rocky Mountain Alpine Bedrock and Scree
0.09%	S004	Rocky Mountain Alpine Fell-Field
0.61%	S006	Rocky Mountain Cliff and Canyon
0.00%	S009	Inter-Mountain Basins Cliff and Canyon
10.55%	S010	Colorado Plateau Mixed Bedrock Canyon and Tableland
1.17%	S011	Inter-Mountain Basins Shale Badland
0.86%	S012	Inter-Mountain Basins Active and Stabilized Dune
0.08%	S013	Inter-Mountain Basins Volcanic Rock and Cinder Land
0.02%	S016	North American Warm Desert Bedrock Cliff and Outcrop
0.01%	S019	North American Warm Desert Volcanic Rockland
0.05%	N31	Barren Lands, Non-specific
0.00%	S015	Inter-Mountain Basins Playa
0.00%	S022	North American Warm Desert Playa

OPEN WATER (0.7%)

Percent of ecoregion	Code	Ecological System
0.71%	N11	Open Water

CRYPTOGAMIC CRUST

Cryptogamic crust	NA	Ecological System

Classes adapted from:

Lowry, J. H, Jr., R. D. Ramsey, K. Boykin, D. Bradford, P. Comer, S. Falzarano, W. Kepner, J. Kirby, L. Langs, J. Prior-Magee, G. Manis, L. O'Brien, T. Sajwaj, K. A. Thomas, W. Rieth, S. Schrader, D. Schrupp, K. Schulz, B. Thompson, C. Velasquez, C. Wallace, E. Waller and B. Wolk. 2005. *Southwest Regional Gap Analysis Project: Final Report on Land Cover Mapping Methods*, RS/GIS Laboratory, Utah State University, Logan, Utah.

APPENDIX 2. Fine Filter Plant Species Conservation Elements representative of principle Ecological Systems.

ECOLOGICAL SYSTEM	% OF ECOREGION	FINE FILTER SPECIES	SCIENTIFIC NAME
Colorado Plateau Pinyon-Juniper Woodland	20.4%	Pinyon Pine	*Pinus edulis*
Inter-Mountain Basins Big Sagebrush Shrubland	9.1%	Wyoming Big Sagebrush	*Artemisia tridentate wyomingensis*
Inter-Mountain Basins Montane Sagebrush Steppe	3.9%	Mountain Sagebrush	*Artemisia tridentata ssp. vaseyana*
Colorado Plateau Mixed Bedrock Canyon and Tableland	10.6%	Littleleaf Mountain Mahogany	*Cercocarpus intricatus*
Rocky Mountain Gambel Oak-Mixed Montane Shrubland	4.5%	Gambel Oak	*Quercus gambelii*
Colorado Plateau Pinyon-Juniper Shrubland	6.3%	Utah Juniper	*Juniperus osteosperma*
Colorado Plateau Blackbrush-Mormon-Tea Shrubland	6.3%	Blackbrush	*Coleogyne ramosissima*
Inter-Mountain Basins Mixed Salt Desert Scrub	5.4%	Shadscale	*Atriplex confertifolia*
TOTAL AREA	66.5%		

APPENDIX 3. Selection Criteria for Landscape Species Screening

Habitat heterogeneity: The number of natural major ecological systems within the ecoregion that the species is known to use, divided by the total number of ecological systems in the ecoregion, and scaled between 0 – 1, with higher values representing greater utility as a landscape species for the REA (Prior-Magee et al. 2007).

Area requirements: A binned estimate of the approximate home-range size class, scaled between 0–1 (< 1km^2 = 0, 1 – 10km^2 = 0.25, 10 – 25km^2 = 0.5, 25 – 50km^2 = 0.75, >50km^2 = 1) as recommended by Coppolillo *et al*. (2004). A binned estimate (based on SWReGAP species distribution maps) of the approximate proportion of the ecoregion used by the species (<5% = 0, 5 – 10% = 0.25, 10 – 25% = 0.5, 25 – 50% = 0.75, >50% = 1). These two measures will be summed and divided by 2 to normalize the area-requirement metric.

Vulnerability to anthropogenic disturbance: We based the vulnerability criterion on a reclassification of the Global and State ranking systems. A rounded G-rank of G5(or T5) was assigned "0", G4(or T4) was assigned "0.25", G3(or T3) was assigned "0.5", G2(or T2) assigned "0.75", and G1(or T1) assigned "1".State ranks were averaged and assigned scores in the same way. The vulnerability score was based on the higher of the G-rank (T-rank) and S-rank for each candidate species. The vulnerability scores were intended to reflect the status of the species within the ecoregion, from secure (0), apparently secure (0.25), vulnerable (0.5), imperiled (0.75), or critically imperiled (1.0).

Functionality: Functions are defined as (1) predation, (2) prey base, (3) seed dispersal, (4) seed predation, (5) pollination, (6) mechanical disturbance, and (7) strong competitive interactions. Species lacking a strong role for a specific function are assigned a 0, those with a clear role received a score of 1, based on best professional judgment. The function scores are summed and then divided by the maximum number of functions a species on the list received to normalize the functional score.

Socio-economic significance: The score is based on the sum of following binary characteristics: (1) a flagship species, (2) has a positive social value, (3) has a negative social value, (4) has a positive economic value, and (5) has a negative economic value, based on best professional judgment. The score ranges from 0–1, with 0 having little or no socio-economic value, and 1 having considerable socioeconomic value, scored thus: 0 = 0, 1 = 0.33, 2 = 0.66, and 3+ = 1.

The five categories of scores are summed and defined as the landscape species Aggregate Score. Species with the highest scores were considered most suitable for consideration among the suite of landscape species. The final selection of species was based on both the aggregate score and the types of the Ecological Systems used, as noted above. The species with the highest aggregate score was selected first, followed by the species with the next highest score, which also has the least overlap in Ecological Systems (coarse filter vegetation communities) used. The process continued until all of the ecological systems were accounted for among the suite of selected landscape species. Coppolillo *et al*. (2004) suggest that we begin with 10 – 25 species, and ultimately select 4 – 6 landscape species. In our approach, we began with 25 – 30 species, with the intent to select no more than 10. Our candidate species were drawn from the species lists in the State Wildlife Action Plans and from the list of modeled vertebrates in the SWReGAP final report (Prior-Magee et al. 2007).

We found that this approach was not very suitable for the selection of aquatic species, unless they were treated separately. We opted to simplify the process and hand select likely vulnerable candidates representing the major types of aquatic ecological systems in the ecoregion. In addition, we found that riparian areas were not well represented in the final suite of selected species. We then selected a riparian obligate with the widest distribution and highest aggregate score and added it to the suite of landscape species.

Appendix 4. Candidate Landscape Species and Scores for the Colorado Plateau Ecoregion

SPECIES	SCIENTIFIC NAME	AREA	HETEROGENEITY	VULNERABILITY	FUNCTIONALITY	SOC. ECON. SIGNIFICANCE	SPECIES SCORE
Mountain lion	*Puma concolor*	1.00	0.77	0.25	0.50	1.00	3.52
American peregrine falcon	*Falco peregrinus*	1.00	0.57	0.75	0.50	0.40	3.22
Big free-tailed bat	*Nyctinomops macrotis*	1.00	0.69	0.75	0.00	0.40	2.84
Golden eagle	*Aquila chrysaetos*	1.00	0.45	0.25	0.50	0.60	2.80
Bighorn sheep	*Ovis canadensis*	0.75	0.42	0.50	0.50	0.60	2.77
Gunnison sage-grouse	*Centrocercus minimus*	1.00	0.09	1.00	0.00	0.60	2.69
Bobcat	*Lynx rufus*	1.00	0.55	0.00	0.50	0.60	2.65
Kit fox	*Vulpes macrotis*	0.50	0.36	0.50	1.00	0.20	2.56
Burrowing owl	*Athene cunicularia*	0.25	0.34	0.50	1.00	0.40	2.49
Gunnison's prairie dog	*Cynomys gunnisoni*	0.00	0.19	0.50	1.00	0.60	2.29
White-tailed prairie dog	*Cynomys leucurus*	0.00	0.12	0.50	1.00	0.60	2.22
Black-footed ferret	*Mustela nigripes*	0.00	0.12	1.00	0.50	0.60	2.22
Greater sage-grouse	*Centrocercus urophasianus*	1.00	0.09	0.50	0.00	0.60	2.19
Mule deer	*Odocoileus hemionus*	0.25	1.00	0.00	0.50	0.40	2.15
Pinyon jay	*Gymnorhinus cyanocephalus*	0.25	0.22	0.25	1.00	0.40	2.12
Mexican spotted owl	*Strix occidentalis lucida*	0.25	0.11	0.75	0.50	0.40	2.01
Pronghorn	*Antilocapra americana*	1.00	0.16	0.25	0.00	0.40	1.81
Southwestern willow flycatcher	*Empidonax traillii extimus*	0.00	0.12	1.00	0.00	0.60	1.72
Razorback sucker	*Xyrauchen texanus*	0.00	0.00	1.00	0.00	0.60	1.60
Canyon treefrog	*Hyla arenicolor*	0.00	0.00	0.50	0.50	0.20	1.20
Arizona toad	*Bufo microscaphus*	0.00	0.04	0.75	0.00	0.40	1.19
White-tailed jackrabbit	*Lepus townsendii*	0.00	0.17	0.25	0.50	0.20	1.12
Sage sparrow	*Amphispiza belli*	0.00	0.41	0.50	0.00	0.20	1.11
Olive-sided flycatcher	*Contopus cooperi*	0.00	0.22	0.50	0.00	0.20	0.92
Colorado River cutthroat	*Oncorhynchus clarkii pleuriticus*	0.00	0.00	0.50	0.00	0.40	0.90
Northern leopard frog	*Rana pipiens*	0.00	0.10	0.50	0.00	0.20	0.80
Black-throated sparrow	*Amphispiza bilineata*	0.00	0.23	0.25	0.00	0.20	0.68
Yellow-breasted chat	*Icteria virens*	0.00	0.12	0.25	0.00	0.20	0.57
Sage thrasher	*Oreoscoptes montanus*	0.00	0.36	0.00	0.00	0.20	0.56
Juniper titmouse	*Baeolophus ridgwayi*	0.00	0.17	0.00	0.00	0.20	0.37

Appendix 5. Final Selection of Landscape Species for the Colorado Plateau Ecoregion identified using a modified version of the Coppolillo *et al*. (2004) approach (see text for details).

SPECIES	AREA	HETEROGENEITY	VULNERABILITY	FUNCTIONALITY	SOCIO-ECONOMIC SIGNIFICANCE	SPECIES SCORE
Mountain lion	1.00	0.77	0.25	0.50	1.00	3.52
American peregrine falcon	1.00	0.57	0.75	0.50	0.40	3.22
Big free-tailed bat	1.00	0.69	0.75	0.00	0.40	2.84
Desert Bighorn sheep	0.75	0.42	0.50	0.50	0.60	2.77
Bobcat	1.00	0.55	0.00	0.50	0.60	2.65
Kit fox	0.50	0.36	0.50	1.00	0.20	2.56
Burrowing owl	0.25	0.34	0.50	1.00	0.40	2.49
Yellow-breasted chat	0.00	0.12	0.25	0.00	0.20	0.57
Razorback sucker	0.00	0.00	1.00	0.00	0.60	1.60
Colorado River cutthroat	0.00	0.00	0.50	0.00	0.40	0.90

Appendix 6. Desired Species Conservation Elements for the Colorado Plateau Ecoregion.

SPECIES	AREA	HETEROGENEITY	VULNERABILITY	FUNCTIONALITY	SOCIO-ECONOMIC SIGNIFICANCE	SPECIES SCORE
Golden eagle	1.00	0.45	0.25	0.50	0.60	2.80
Gunnison sage-grouse	1.00	0.09	1.00	0.00	0.60	2.69
Gunnison's prairie dog	0.00	0.19	0.50	1.00	0.60	2.29
White-tailed prairie dog	0.00	0.12	0.50	1.00	0.60	2.22
Black-footed ferret	0.00	0.12	1.00	0.50	0.60	2.22
Greater sage-grouse	1.00	0.09	0.50	0.00	0.60	2.19
Mule deer	0.25	1.00	0.00	0.50	0.40	2.15
Mexican spotted owl	0.25	0.11	0.75	0.50	0.40	2.01
Pronghorn	1.00	0.16	0.25	0.00	0.40	1.81
Flannelmouth sucker						
Ferruginous hawk						

Appendix 7. Sites of Conservation Concern Conservation Elements selected for the Colorado Plateau Ecoregion.

SITE CLASSES

Terrestrial Sites of High Biodiversity:

- TNC portfolio sites
- Important bird areas (Audubon)
- Areas recognized by Partners-In-Flight

Terrestrial Sites of High Ecological and/or Cultural Value:

- Historic and Nationally Designated Trails
- Wilderness Areas
- Wilderness Study Areas
- Historic Districts
- National Wildlife Refuges
- Monuments
- National and State Parks
- NCAs
- ACECs
- Forest Service Research Natural Areas
- State Wildlife Management Areas
- Suitable Wild and Scenic Rivers
- Designated Recreation Management Areas
- Sensitive Air Quality and Smoke Impact Receptors

Aquatic Sites of High Biodiversity:

- TNC portfolio sites
- EMAP-West Reference Sites

Appendix 8. Functions and Services of Conservation Concern as Conservation Elements selected for the Colorado Plateau Ecoregion.

SITE CLASSES

Terrestrial Functions of High Ecological Value:

- Soil stability
- Forage

Surface and Subsurface Water Availability:

- Aquatic systems of streams, lakes, ponds, etc.
- Springs/seeps/wetlands
- Riparian areas
- High quality and impaired waters
- Groundwater protection zones, sole source aquifers

Appendix 9. Change agents selected for the Colorado Plateau Ecoregion.

CHANGE AGENTS

- Wildland Fire
- Invasive Species
- Land and Resource Use
    - — Urban and Roads Development
    - — Oil, Gas, and Mining Development
    - — Renewable Energy Development (i.e., solar, wind, geothermal, including transmission corridors)
    - — Agriculture
    - — Livestock grazing (proposed by Dynamac)
    - — Wild horse and burro grazing (proposed by AMT)
    - — Wildlife grazing (proposed by AMT)
    - — Groundwater and Surface Water Extraction, Development, and Transportation
    - — Recreational Uses
    - — Pollution (Air Quality)
- Climate change

Appendix 10. Data Needs Assessment Rationale & Potential Needs

A. SOILS, BIOLOGICAL CRUSTS, AND FORAGE MANAGEMENT QUESTIONS

1. Where are soils susceptible to wind and water erosion?
RATIONALE: Use the Revised Universal Soil Loss Equation (RUSLE).
Potential data needs: STASTGO, SSURGO, DEM, LANDFIRE EVT, LANDFIRE BpS, canopy closure, precipitation, slope, aspect, winds.

2. Where are soils with the potential to change from high wind erosion/dust/dunes likely to develop due to climate change or groundwater withdrawal?
RATIONALE: Create a model using the RUSLE combined with Climate, wind, and ground water withdrawals.
Potential data needs: Climate (PRISM; DAYMET; Future Climate Change Scenario), STASTGO, SSURGO, DEM, LANDFIRE EVT, LANDFIRE BpS, Canopy Closure, Precipitation, Slope, Aspect, Winds, groundwater Extraction Areas..

3. Where are sensitive (saline) soils?
RATIONALE: Model using data from above Look for areas that have develop a hardpan, or accumulate water seasonally. Uses techniques by Bowker et al., (2006).
Potential data needs: Sensitive Soils layer, STASTGO, SSURGO, DEM, Geology, NHD, LANDFIRE EVT.

4. Where are the areas of important forage production for livestock, wild horses and burros, and wildlife located?
RATIONALE: We will map out the location of plant communities with important grass and shrub production with allotment locations, and generalize the results to the landscape reporting unit of the 5th level HUC. Non-native species may be included in a separate analysis. Suitability of forage production will require adopting or refiningof behavior models for livestock comparable to a wildlife habitat models (Harris et al. 2002; Bailey 2005; Larsen-Praplan 2009), as well as wild horses, and burros. Forage availability will then be intersected with modeled occupancy layers to identify relative importance of forage with respect to factors influencing behavior of livestock, wild horses, and burros.
Potential data needs: Ownership, NHD, all available surface water sources, including wildlife and stock tanks and guzzlers, soils (STASTGO, SSURGO, sensitive soils layer), slope and aspect (NED), vegetation type (LANDFIRE (EVT, Canopy Closure), forage availability (multi-date MODIS EVI), climate (PRISM, DAYMET), Conservation Elements, Grazing Allotments, Herd Areas (HAs), Herd Management Areas (HMAs), ranches & farms, agricultural census data, AU densities, modeled wild horse habitat usage, modeled burro habitat usage, modeled wildlife habitats, water quality status, PFC data if available, Rangeland Condition Assessments if available, possibly mapped distribution of non-native plants of forage value.

5. What is the potential for future change to forage production from change agents?
RATIONALE: We will map out the location of plant communities with important grass and shrub production with allotment locations, and generalize the results to the landscape reporting unit of the 5th level HUC. Non-native species may be included in a separate analysis. Forage availability layers will be developed (see previous management question), and vulnerability to change in the near future (2025) by wildfire, invasive species, and development. Potential forage availability under a climate change scenario will be modeled for 2060, based on general relationships between potential vegetation, soils, topography, and climate. A space-for-time relationship may be developed between current forage potential, soil groups, and an aridity index using multi-temporal MODIS EVI data, and

then applied to future conditions under the altered climate regime. Forage availability will be modeled with foraging behavior (Harris et al. 2002; Bailey 2005; Larsen-Praplan 2009), to identify areas most available to livestock, wild horses, and burros as a function of factors such as air temperature, distance to surface water, and topography.
Potential data needs: Ownership, NHD, all available surface water sources, including wildlife and stock tanks and guzzlers, soils (STASTGO, SSURGO, sensitive soils layer) slope and aspect (NED), vegetation type (LANDFIRE (EVT, Canopy Closure), forage availability (multi-date MODIS EVI), current climate (PRISM, DAYMET), future climate (2060 model data), Grazing Allotments, Herd Areas (HAs), Herd Management Areas (HMAs), ranches & farms, agricultural census data, modeled wild horse habitat usage, modeled burro habitat usage, modeled wildlife habitats, Rangeland Condition Assessments if available, possibly mapped distribution of non-native plants of forage value, fire susceptibility (generated using LANDFIRE as a component of additional management questions related to wildfire risk), risk of invasive species (generated as a component of additional management questions related to invasive species spread risk), Human footprint variables, including areas of probable future energy development (also developed to address management questions related to development).

6. Where are soils that have or have potential to have cryptogamic soil crusts?
RATIONALE: Model using data from above looking for areas that have develop cryptogamic soils, extract data attributes (e,g, slope, soil type, EVT) and develop a model (Bowker et al. 2006).
Potential data needs: STASTGO, SSURGO, DEM, Geology, NED, EVT, Slope, Aspect, precipitation (PRISM, DAYMET).

7. Where are these intact cryptogamic crusts located?
RATIONALE: Examine locations of existing cryptogamic crust to see if attributes of STASTGO, or SSURGO data have a relationship with these locations. Model distribution of crusts using techniques by Bowker et al., (2006), and the potential for degradation using a model such as that described in Bowker et al. 2008, based on distance from roads, distance from ranching infrastructure, grazing allotments & pastures, rangeland productivity (USDA-NRCS 2005), and derivatives of a DEM.
Potential data needs: STASTGO, SSURGO, surficial geology, precipitation (PRISM, DAYMET), elevation (NED), sampled locations (Bowker et al.), human footprint layer, OHV use areas and vulnerable areas, livestock habitat model (forage (LANDFIRE EVT, BpS, MODIS EVI), NDH, guzzler/tank locations, slope, aspect, allotments).

8. What/where is the potential for future change to the cryptogamic crusts?
RATIONALE: Once the distribution of cryptogamic soils have been modeled (question 7), climate data and anthropogenic disturbance information such as OHV use may be used to indicate future changes (Belnap 2002, Bowker et al. 2008, Paine et al. 1998).
Potential data needs: Planned development layers (2025), future precipitation (2060 climate change model), STASTGO, SSURGO, surficial geology, modeled likelihood of crust (Bowker et al. 2006).

9. Where are areas producing fugitive dust that may contribute to accelerated snow melt in the Colorado Plateau?
RATIONALE: Locate areas that have highly erosive soils via STASTGO or SSURGO, and low potential vegetation cover, or low/no current vegetation cover (oil/gas pads, dirt roads, etc.). Seasonal prevailing wind direction and strength might be mapped as plumes with respect to snowpack locations (Gleason et al. 2007).
Potential data needs: SSURGO, STASTGO, PRISM, DAYMET, LANDFIRE, unimproved roads layer, energy development infrastructure, LANDFIRE BpS & EVT, and wind data

B. SURFACE AND GROUNDWATER MANAGEMENT QUESTIONS

1. Where are the surface waterbodies and livestock and wildlife watering tanks?
RATIONALE: N/A.
Potential data needs: NHD, Guzzler Locations if available.

2. What is the persistence of the flow (e.g., perennial, ephemeral) of these systems?
RATIONALE: NHD code for flow status (perennial, intermittent, ephemeral), estimate flow status misclassification rate using EMAP-West field data by area and Strahler order. Link stream gage data to upstream systems. Possibly also investigate geology and soils (STASTGO or SSURGO) for permeability.
Potential data needs: NHD, EMAP-West field data stream flow status observations, Geology, DEM, STASTGO, SSURGO,

3. Which surface waters are likely dependent on seasonal precipitation, and what are the characteristics of their current seasonal flows?
RATIONALE: NHD flow status codes ephemeral, intermittent, gage station hydrograph curve characteristics relative to precipitation patterns in the catchment.
Potential data needs: NHD, gage data, PRISM, DAYMET, DEM, possibly STASTGO, SSURGO, geology

4. Where are the aquifers and their recharge areas?
RATIONALE: Use currently mapped recharge area maps where available. Develop a relationship with respect to aquifers and recharge areas as discussed by Brown (1995). Also evaluate soil and geology substrate for water flow.
Potential data needs: Aquifer locations, NED, NHD, geology, possibly STASTGO, SSURGO

5. Which surface waters are likely dependent on groundwater to maintain their ecological condition?
RATIONALE: Recode NHD for perennial only, with NWI, and topographic position, precipitation data, stream gage data (hydrograph characteristics) relative to patterns of precipitation received. Estimate error associated with perennial streams by Strahler order from EMAP-West field database by region.
Potential data needs: NHD, NWI, NED, stream gage data, precipitation data (PRISM, DAYMET)

6. What is the condition of these various aquatic systems defined by PFC?
RATIONALE: Compile existing maps of surveys of PFC if available. Develop a relationship with anthropogenic disturbance in relation to indicators of quality of these aquatic streams. We may draw upon the EMAP-West project data (Stoddard et al., 2005) to predict expected average values of indicators of ecological integrity (stream chemistry metrics, sediment, macroinvertebrate IBIs, fish IBIs) for all wadable streams in the ecoregion, report them in qualitative terms. This is the single resource of ecoregions for which ecological integrity can be estimated based on empirically-developed indicators calibrated to a landscape-level anthropogenic disturbance gradient, and adjusted for stream size and region. Since it was based on a probability sample to provide a statistically valid estimate of the condition of the nation's waters, the correlative relationship between landscape disturbance and in-stream indicators of ecological integrity remain valid throughout the ecoregion. It is not meant to convey prediction to any single site or stream. Also evaluate soil and geology to gauge susceptibility of banks to erosion and potential sediment transport from anthropogenic disturbance in watershed.

Potential data needs: NHD, NLCD, TIGER roads, watershed boundaries, 303 (d) streams, TMDLs, Wild and Scenic Rivers, EO's of Aquatics, SSURGO, STASTGO, LANDFIRE BpS & EVT, RUSLE Metric layer (EMAP-WEST), other EMAP-WEST landscape condition metrics.

7. Where are degraded aquatic systems (e.g., water quality)?
RATIONALE: We will draw upon the EMAP-West project data (Stoddard et al., 2005)to predict expected average values of indicators of ecological integrity (stream chemistry metrics, sediment, macroinvertebrate IBIs, fish IBIs) for all wadable streams in the ecoregion, report them in qualitative terms. This is the single resource for which ecological integrity can be estimated based on empirically-developed indicators calibrated to a landscape-level anthropogenic disturbance gradient, and adjusted for stream size and region. Since it was based on a probability sample to provide a statistically valid estimate of the condition of the nation's waters, the correlative relationship between landscape disturbance and in-stream indicators of ecological integrity remain valid throughout the ecoregion. It is not meant to convey prediction to any single site or stream. To supplement this, we may also map 303 (d) streams.
Potential data needs: NHD, NLCD, TIGER Roads, watershed boundaries, EO's of Aquatics, STASTGO, SSURGO, Geology, DEM, NWI.

8. What is the location/distribution of these (aquatic) sites?
RATIONALE: Develop a data set with the locations of these aquatic sites using ancillary data such as soils, geology, and slope aspect. Also using techniques outlined by Kumar et al. (2009).
Potential data needs: NHD, Streams, EO's of Aquatics, and aquatic sites of conservation concern, Geology, STASTGO, SSURGO, DEM, slope, aspect, LANDFIRE (EVT), aquifer locations.

9. What/Where is the potential for future change to these (aquatic) high biodiversity sites in the near-term, 2025 (development), and long-term, 2060 (climate change)?
RATIONALE: Mapping vulnerability to planned or probable development and changes in land use will be used to assess near-term potential changes to high biodiversity sites, and aquatic sites of ecological importance. We plan to use an approach based on association of aquatic ecosystem integrity with land use described in Stoddard et al. 2005, with projected near future development scenario modeling using an approach based on Hulse et al. (2002), and Baker et al. (2004). An attempt will also be made to assess risk of aquatic invasives. Future condition assessments associated with climate change may be based on BOR data if available. If not available, or if coverage is not complete, we will estimate regions of increased and decreased forecast precipitation, or changes in seasonality of precipitation, as an indicator of potential changes to aquatic site condition.
Potential data needs: NHD, spring locations, NWI, watershed boundaries, site locations, current land cover and human footprint layers, areas of planned or projected growth and development, including dam construction, gage data, current climate data (PRISM or DAYMET), future climate data (2060 climate change scenario data), BOR flow change projection data if available.

10. Where are the areas of high and low groundwater potential?
RATIONALE: Develop a relationship with the SSURGO and or STASTGO with precipitation from PRISM or DAYMET (Brown 1995).
Potential data needs: NHD, Streams, SSURGO, STASTGO, PRISM, DAYMET, geology, aquifer locations.

11. Where are the areas showing effects from existing groundwater extraction?
RATIONALE: Obtain monitored well data, associate monitored wells with aquifers, characterize flow rates over time.
Potential data needs: Monitored deep well locations and longitudinal data, Aquifer Locations, Ground water extraction areas,

12. Where are artificial water bodies, including evaporation ponds, etc.?
RATIONALE: None.
Potential data needs: NHD, other existing coverages which include artificial water bodies.

C. ECOLOGICAL SYSTEMS MANAGEMENT QUESTIONS

1. Where are these intact vegetative communities located?
RATIONALE: Evaluate each of the ecological systems with respect to patch size, level of fragmentation via roads and other development (Riitters et al. 2002).
Potential data needs: STASTGO, SSURGO, LANDFIRE (EVT, canopy closure, potential vegetation), DEM, NLCD, slope, aspect, road density, fragmentation, and fire.

2. What/where is the potential for future change to the community?
RATIONALE: Evaluate temporal and spatial changes to Ecological Systems due to climate change (long-term, 2060) and short term development (2025, Theobald 2010). The long-term change would likely be based on the change in potential distribution of a dominant characteristic plant species in the community, rather than the community itself, since changes in potential distribution will vary by species.
Potential data needs: Current distribution of a dominant, characteristic plant species representative of the Ecological System, STASTGO, SSURGO, LANDFIRE (EVT, canopy closure, potential vegetation), DEM, NLCD, current climate bioclimatic variables derived from PRISM or DAYMET, 2060 climate scenario bioclimatic variables, slope, aspect, road density, fragmentation, human footprint, and fire.

3. Where are the (Conservation/Reserve Program) areas?
RATIONALE: N/A.
Potential data needs: Mapped Conservation/Reserve Program areas.

D. SPECIES CONSERVATION ELEMENT MANAGEMENT QUESTIONS

1. What is the current distribution of occupied habitat, including seasonal habitat, and movement corridors?
RATIONALE: Develop new distributions of occupied habitat using NHP EO data coupled with LANDFIRE EVT, Canopy Closure, and use existing occupied habitat, seasonal habitat and movement corridors.
Potential data needs: NHP EO's, LANDFFIRE (EVT, canopy closure, potential vegetation), identified movement corridors, seasonal habitats, Biological Significance Ranking (NHP) for landscape-species and desired species conservation elements.

2. What areas known to have been surveyed and what areas have not known to have been surveyed (i.e., data gap locations)?
RATIONALE: Absence of evidence is not evidence of absence. We will identify areas for which survey data exists. Locations where so survey data was identified will be reported as "unknown", or a data gap.
Potential data needs: NHP EO's, LANDFFIRE (EVT, canopy closure, potential vegetation), movement corridors, seasonal habitats, Biological Significance Ranking (NHP).

3. Where are change agents affecting these habitat and movement corridors?
RATIONALE: Develop a *species-specific* set (for landscape-species and desired species) of ranking criteria of the spatial coincidence of change agents (specific types of human footprint components) coupled with NHP EO's, EVT, canopy closure, movement corridors, and seasonal habitats. Also evaluate habitat fragmentation via road density or distance from roads and use distance from active or abandoned mines. Look to see how invasive species are affecting these habitats.
Potential data needs: NHP EO's, LANDFFIRE (EVT, canopy closure, potential vegetation), NLCD, city lights, movement corridors, seasonal habitats, Biological Significance Ranking (NHP), fire, atmospheric deposition, grazing, forest management (logging, control fire), drought, human footprint (development), road density, invasive species, active and abandoned mines.

4. Where are habitats that may be limiting species sustainability?
RATIONALE: Develop a ranking criteria by species conservation element based on the literature and best professional judgment of specialists with the species and area of Ecological Systems needs (patch size). Also look at fragmentation and invasive species competition with existing Ecological Systems. And/or prepare the data to run in a linear optimization program (e.g. Marxan) where goals and penalty factors are set and outcomes can be observed.
Potential data needs: NHP EO's, LANDFFIRE (EVT, canopy closure, potential vegetation), NLCD, city lights, road density, forest fragmentation, invasive species, active and abandoned mines.

5. Where are species populations at risk?
RATIONALE: Conduct a risk assessment where species populations, look at road density, forest fragmentation, invasive species, and human footprint. The nature of the footprint will attempt to reflect differential sensitivity of each species conservation element to different types of disturbance (e.g., highway vs. power line).
Potential data needs: NHP EO's, LANDFFIRE (EVT, canopy closure, potential vegetation), NLCD, city lights, road density, forest fragmentation, species population distributions, invasive species, human footprint components, active or abandoned mines, grazing, develop a ranking criteria and or prepare the data to run in a linear optimization program (e.g. Marxan) where goals and penalty factors are set and outcomes can be observed.

6. Where are potential habitat restoration areas?
RATIONALE: Develop a ranking criterion and conduct a risk assessment where species populations occur, look at road density, forest fragmentation, invasive species, and human footprint. And or prepare the data to run in a linear optimization program (e.g. Marxan) where goals and penalty factors are set and outcomes can be observed. Potential habitat restoration would also consider factors influencing reestablishment of target vegetation, based on biophysical setting, soils, and precipitation.
Potential data needs: NHP EO's, LANDFFIRE (EVT, Canopy Closure, Potential Vegetation), soils (STATSGO), topographic position (NED), climate (PRISM, DAYMET), NLCD, and other ancillary data such as city lights, forest fragmentation, grazing , abandoned and active mines, and road density.

7. Where are potential areas to restore connectivity?
RATIONALE: Run Marxan and try iterations with the Boundary Length Modifier coupled with the 8 Ecological Systems and 22 species to help identify connectivity areas. Evaluate and rank these connectivity areas with respect to Forest Fragmentation, grazing, active and abandoned mine activity.
Potential data needs: NHP EO's, LANDFFIRE (EVT, Canopy Closure, Potential Vegetation), soils (STATSGO), topographic position (NED), climate (PRISM, DAYMET), NLCD, city lights, forest fragmentation, grazing, abandoned and active mines, road density.

8. What is the location/distribution of these (terrestrial) sites?
RATIONALE: A list of site classes of ecological or conservation concern has been compiled and will be mapped. In addition, areas of high biodiversity will be generated based on G1 – G3 species occurrence richness within 5th level HUCs. This process could be address using Marxan runs. Assuming that we are using 5th level Hydrological Units (HUC), we set goals on key species such that individual watersheds are identified with respect to biodiversity criteria.
Potential data needs: NHP EO's, HUC boundary file, various site lists identified in Memorandum I.1-c, LANDFFIRE (EVT, Canopy Closure, Potential Vegetation), and biodiversity sites.

9. What/where is the potential for future change to these high-biodiversity sites in the near-term horizon, 2020 (development) and a long-term change horizon, 2060 (climate change)?
RATIONALE: Develop a model of temporal changes in these High-Biodiversity sites for the short term using anthropogenic change development based on a simplified alternate future landscape scenario approach (Baker et al. 2004, Schumaker et al. 2004), and long-term using climate change (Theobald 2010).
Potential data needs: Land use, land use planning areas, population growth projections, Climate Change, Biodiversity Sites, NHD, USEPAs EMAP-West landscape metric layers, USEPAs EMAP-West indicators of stream condition data and landscape disturbance data, forest fragmentation, human footprint, invasive species, grazing, atmospheric deposition, road density, forest insect and diseases.

10. Where are the current wild horse and burro populations?
RATIONALE: Map herd areas (HAs), and Herd Management Areas (HMAs). In the event that wild horse populations are not identified, we would model there potential location using water (NHD) and LANDFIRE (EVT).
Potential data needs: Herd Areas (HA) datalayer, Herd Management (HMA) data layer, possibly also NHD (Spring, Seeps, Streams), NED derivatives, LANDFIRE (EVT), wild horse and burro populations.

11. What/where is the potential for future change to this species in the near-term horizon, 2020 (development) and a long-term horizon, 2060 (climate change)?
RATIONALE: Develop spatial and temporal models using the input data and assigning change criteria associated with the short term change (development, Hulse et al. 2002; Baker *et al*. 2004; Schumaker *et al*. 2004) and long term (climate change). Assess areas with the greatest amount of change (Theobald 2010).
Potential data needs: NHP EO's, HUC (fifth Level), NLCD, city lights, climate change, anthropogenic disturbance (grazing, forest fragmentation, road density, human footprint).

12. Where are the areas of core conservation aquatic species habitat change?
RATIONALE: We will use BOR data under development if available as applicable. We will characterize areas associated with aquatic conservation species by relating occurrence data locations to NHD data, and mapping presumed range, and associated terrestrial conditions associated with in-stream conditions, including elevation range, slope, and riparian conditions (e.g., riparian canopy

conditions, watershed land use for the Colorado River Cutthroat). Rather than attempt to model changes in flow rates or water temperatures, we will identify portions of currently occupied habitat in which precipitation levels increase or decrease, and air temperatures are expected to increase or decrease, we will identify areas influenced by surface water withdrawals and dams. Watershed landcover changes associated with current and projected anthropogenic activities will be used as a surrogate for aquatic habitat changes. Changes in riparian tree species distributions may be modeled for headwater areas.
Potential data needs: NHD, species occurrence data (event data for NHD traces), NLCD data, LANDFIRE layers, NED, PRISM or DAYMET data, STASTGO, Human footprint layers, including dams, water diversions.

E. WILDFIRE MANAGEMENT QUESTIONS

1. Where are the areas that have been changed by wildfire between 1999 and 2009?
RATIONALE: Identify fire frequency from 1999 – 2009 evaluate vegetation change patterns using LANDFIRE EVT and potential vegetation (Barrett 2004), fire history, fire boundaries, and fire severity maps.
Potential data needs: LANDFFIRE (EVT, canopy closure, potential vegetation), fire history (1999–2009), fire boundaries, fire severity maps.

2. Where are the areas with potential to change from wildfire?
RATIONALE: Identify LANDFIRE EVT types that are not fire adapted or have infrequent fires. Also look at areas that have uncommon large stand replacing fires. Rank areas based on relative density of natural ignition sources (lightning strikes), and human sources (fires attributable to human ignitions).
Potential data needs: LANDFFIRE (EVT, canopy closure, potential vegetation), fire history (1999 – 2009), LANDFFIRE (Fire Regime Departure of Condition class), LANDFFIRE (mean fire return interval), LANDFIRE (simulated historical percent of low, mixed and replacement Fires, lighting strike layer, human-caused fire layer, climate (PRISM, DAYMET).

3. Where are the Fire Regime Condition Classifications?
RATIONALE: Based on LANDFIRE.
Potential data needs: LANDFIRE (Reference Fire Regimes, Fire Regime Departure of Condition class).

4. **Where are collaborative strategic prevention actions taking place?**
RATIONALE: Assess the Wildland Urban Interface (WUI) coupled with County, State, and Federal fire prevention action plans.
Potential data needs: LANDFFIRE (EVT, canopy closure, potential vegetation), Fire History (1999 – 2009), LANDFIRE (Fire Regime Departure of Condition class), LANDFIRE (Mean Fire Return Interval), LANDFIRE (simulated historical percent of low, mixed and replacement fires, Wildland Urban Interface (WUI), county, state, and federal fire prevention action plans.

5. Where is fire adverse to ecological communities, features, and resources of concern?
RATIONALE: Asses the Wildland Urban Interface (WUI), LANDFIRE EVT, Resources of Concern (including sites managed for specific vegetation type), reference fire return interval and severity
Potential data needs: LANDFIRE (EVT, Canopy Closure, Potential Vegetation, Historic Fire Regimes), DEM, Slope, Aspect, Fire History (1999 – 2009), LANDFIRE (Fire Regime Departure of Condition class), LANDFIRE (Mean Fire Return Interval), LANDFIRE (simulated historical percent of low, mixed and replacement fires, Wildland Urban Interface (WUI), Sites of ecological concern,

viewsheds, areas where risk of invasive species establishment is high following fire (output of invasive species risk models).

F. INVASIVE SPECIES MANAGEMENT QUESTIONS

1. Where are areas dominated by this invasive species?
RATIONALE: We will use mapped occurrence and survey data where available, supplemented by modeling. In the event that a comprehensive data set for invasive does not exist, or that an existing model does not exist, we will likely model these data using modeling programs such as Maxent, for a conservative estimate, or another presence-only bioclimatic habitat modeling algorithm, or Ensemble modeling (Snyder et al. 2007; Stohlgren et al. 2010). For certain invasive plant species, we may be able to supplement existing mapped occurrence and survey data by classifying MODIS EVI on the phenological characteristics of species such cheatgrass following an approach analogous to that described in Nussear *et al*. (2009) for mapping annual grass & forb availability.
Potential data needs: Invasive species occurrence data, climate derivatives (PRISM, DAYMET), STASTGO, SSURGO, LANDFIRE (EVT, Canopy Closure, Potential Vegetation), DEM, LANDFIRE (Fire Regime Departure of Condition class), LANDFIRE (Mean Fire Return Interval), LANDFIRE (simulated historical percent of low, mixed and replacement fires, slope, aspect, fire), possibly multi-date MODIS EVI.

2. Where are the areas of potential future encroachment from this invasive species?
RATIONALE: Using the model technique listed in the previous management question, we could develop a future dispersion model using humans (Roads) as a primary dispersion vector (Colunga-Garcia et al. 2009; Stohlgren et al. 2010; Thuiller et al. 2005). For longer-term (2060) predictions, we would use a model based on soils, potential vegetation, and bioclimatic variables, such as MAXENT, or GARP.
Potential data needs: Climate derivatives (PRISM, DAYMET, supplied 2060 climate change data), STASTGO, SSURGO, LANDFIRE (EVT, Canopy Closure, Potential Vegetation), DEM, climate change, Invasive Species, LANDFIRE (Fire Regime Departure of Condition class), LANDFIRE (Mean Fire Return Interval), LANDFIRE (simulated historical percent of low, mixed and replacement fires), slope, aspect, human footprint, road density, and recently burned areas.

3. Where are areas of suitable biophysical setting (precipitation/soils, etc.) with restoration potential?
RATIONALE: Identify areas where soil conditions and precipitation are optimal for reestablishment of the native plant species, assigning higher value to areas with lower risk of reintroduction and establishment of the invasive.
Potential data needs: Climate derivatives (PRISM, DAYMET), STASTGO, SSURGO, LANDFIRE (EVT, Canopy Closure, Potential Vegetation), DEM, climate change, Invasive Species, LANDFIRE (Fire Regime Departure of Condition class), LANDFIRE (Mean Fire Return Interval), slope, aspect, human footprint, road density.

G. FUTURE DEVELOPMENT MANAGEMENT QUESTIONS

1. Where are areas of planned development (e.g., plans of operation, governmental planning)?
RATIONALE: Identify areas that have planned development. Model these areas using techniques used by Theobald (2010).

Potential data needs: City, county, state, and federal development plans (current and potential), roads, NLCD.

2. Where are areas of potential development (e.g., under lease), including sites and transmission corridors?
RATIONALE: Identify areas that have planned development including transmission corridors.
Potential data needs: Roads, NLCD, city, county, state, and federal development plans (current and potential), identified transmission corridors, leased oil & gas areas, leased renewable sites, mapped conventional energy development areas, mapped renewable energy suitability areas.

3. Where are the surface waters that might be vulnerable to flow reduction as a result of groundwater extraction?
RATIONALE: Identify surface water areas that are adjacent or downstream from ground water extraction areas.
Potential data needs: NHD (perennial & possibly intermittent flow classifications), NWI, DEM, STASTGO, SSURGO, ground water extraction areas, monitored wells and longitudinal data, aquifer locations.

H. RESOURCE USE MANAGEMENT QUESTIONS

1. Where are high-use recreation sites, developments, infrastructure or areas of intensive recreation use located (including boating)?
RATIONALE: Identify water areas that are recreation sites and rank these areas by visitor use (Paine et al. 1998).
Potential data needs: NHD, NLCD, recreation management areas and infrastructure, detailed roads data, lakes database, permitted use areas, urban areas.

2. Where are areas of concentrated recreation travel (OHV and other travel) located?
RATIONALE: Identify areas that contain OHV recreational opportunities and rank these areas by visitor use. Model areas with differing relative likelihood of OHV access/use based on access, vegetation, topography, and land ownership status typical of OHV use.
Potential data needs: Detailed roads layer, Urban Areas, OHV use areas, Permitted use areas, Recreational Sites, NED derivatives, LANDFIRE EVT, administrative boundaries.

3. Where are permitted areas of intensive recreation use (permit issued)?
RATIONALE: Identify areas that contain designated OHV recreational opportunities and or any other recreational opportunity rank these areas by visitor use.
Potential data needs: Permitted use areas, roads.

4. What are planned areas for disposal that may cause change of Federal ownership?
RATIONALE: Identify areas that are or slated to become disposal sites on federal property.
Potential data needs: Ownership, planned disposal sites.

5. Where does/has grazing occur/occurred?
RATIONALE: Identify areas that had or currently have grazing. Most areas have been subjected to livestock grazing at some point historically. Some areas in the landscape tend to receive greater relative pressure. Relative probability of past grazing will be based on livestock behavior models (Harris et al. 2002; Bailey 2005; Larsen-Praplan 2009). Mapped PFC status may also be used if available.

Potential data needs: NHD, other surface water sources, including wildlife and stock tanks and guzzlers, vegetation characteristics (LANDFIRE BpS & EVT), areas of higher forage availability (MODIS EVI), soils (STATSGO, sensitive soils layer), slope & aspect (NED), precipitation (PRISM, DAYMET), ownership, grazing allotments, ranches/farms, agricultural census data.

6. Where/How has grazing impacted the current status of conservation elements?
RATIONALE: Obtain Rangeland Health Assessment data if available. Map the number of Rangeland Health Assessment sites and summarize the results for display and reporting by the 5th level HUC landscape reporting unit. Identify areas that had or currently have grazing rank these areas based upon the sites and rank the quality base upon soil erosion, EVT, Canopy Closure, and amount of grazing. Grazing is an impact agent for sensitive soils (Bowker et al. 2006). Livestock behavior models will be used to classify the locations within the landscape which would tend to receive the greatest relative grazing pressure (Harris et al. 2002; Bailey 2005; Larsen-Praplan 2009), and then summarized by potential vulnerability to specific Ecological Systems at the landscape scale. Forage availability will be mapped using the approach adapted from Nussear *et al*. 2009.
Potential data needs: Ownership, NHD, all available surface water sources, including wildlife and stock tanks and guzzlers, soils (STASTGO, SSURGO, sensitive soils layer) slope and aspect (NED), vegetation type (LANDFIRE (EVT, Canopy Closure), forage availability (multi-date MODIS EVI), climate (PRISM, DAYMET), Conservation Elements, Grazing Allotments, ranches & farms, agricultural census data, modeled wildlife habitats, water quality status, PFC data if available, Rangeland Condition Assessments if available, AU densities and timing.

7. Where/How may grazing impact the potential future status of conservation elements?
RATIONALE: Identify areas that had or currently have grazing rank these areas based upon the sites and rank the quality base upon Ecological System, soil erosion, Canopy Closure, and modeled livestock grazing behavior. Assess the needs of conservation element classes and conduct a trend analysis over time (Bowker et al. 2006). Apply models of livestock behavior to rank areas in the landscape where livestock are most likely to spend time (Harris et al. 2002; Bailey 2005; Larsen-Praplan 2009). Forage availability may be mapped following the approach adapted from Nussear et al. 2009.
Potential data needs: Ownership, NHD, STASTGO, SSURGO, DEM, LANDFIRE (EVT, canopy closure), multi-date MODIS EVI, conservation elements, grazing allotments, ranches & farms, agricultural census data.

I. AIR QUALITY MANAGEMENT QUESTIONS

1. Where are the viewsheds adjacent to scenic conservation areas?
RATIONALE: We will use designated viewsheds data. If unavailable**,** then locations on Scenic Conservation Areas need to be collected and organized. Next viewsheds to these scenic conservation areas need to be constructed (using the DEM).
Potential data needs: Designated Viewsheds database, or DEM, Scenic Conservation Areas, and Viewsheds.

2. Where are the viewsheds most vulnerable to change agents?
RATIONALE: Designated viewsheds data will be identified if available. If unavailable, **d**ata on Scenic Conservation Areas would have to be collected or generated. If the data needs to be generated, then locations on Scenic Conservation Areas need to be collected and organized. Next viewsheds to these scenic conservation areas need to be constructed (using the DEM) on these Scenic Conservation Areas (Theobald 2010). Risk from various change agents would be modeled, such as air quality (fire) and development (energy exploration).

Potential data needs: Designated Viewsheds, DEM, relevant Human Footprint components (e.g., energy development areas), SSURGO, STASTGO, Scenic Conservation Areas, LANDFIRE EVT.

3. Where are the designated non-attainment areas and Class I PSD areas?
RATIONALE: We will compile and map Class 1 PSD non- attainment areas. However, if the data does not exist, EPA has point data on certain constituents of concern (COC) with respect to Class 1 PSD. We could generate spatial surfaces using these point data coupled with various surface generating algorithms (e.g., Kriging, Smith et al. 2008).
Potential data needs: Non-attainment areas, SSURGO, STASTGO, PRISM, DAYMET, and atmospheric deposition.

J. CLIMATE CHANGE MANAGEMENT QUESTIONS

1. Where/how will the distribution of dominant native plant species and invasive species change from climate change?
RATIONALE: Construct and validate species potential distributions with the MAXENT algorithm, including bioclimatic variables derived from PRISM or DAYMET climate data, soils, and topographic variables, and NHD & NWI as appropriate. Evaluate native plant parameters (temperature and precipitation), then asses how environmental and edaphic factors change due to climate modifications (Sutherland and Nelson 2010).
Potential data needs: STASTGO, SSURGO, Climate Change model (2060) data, PRISM, DAYMET, NED, NHD, NWI, and Fire.

2. Where are areas of potential for fragmentation as a result of climate change in 2060?
RATIONALE: Evaluate current fragmentation and develop future fragmentation base upon Climate Change (Riitters et al. 2002; Theobald 2010)**.**
Potential data needs: STASTGO, SSURGO, Climate Change, PRISM or DAYMET, and Human footprint (projected).

3. Where are areas of core conservation species change as a result of climate change?
RATIONALE: We will likely use some variant of a spatial translation of NatureServe's Climate Change Vulnerability Index tool. Another possible approach would be to use the areas of concentration of core conservation species we could model how soil, air temperature, and precipitation would change under certain climate scenarios. These changes would be the driving forces in changing areas of core conservation.
Potential data needs: STASTGO, SSURGO, Climate Change model data, PRISM or DAYMET, Human footprint (projected).

4. Where are aquatic/riparian areas with potential to change from climate change?
RATIONALE: We will apply an aridity index calculated using the alternate climate scenario, in conjunction with the BOR modeled flow data. In addition, using the current distribution of Ecological Systems characteristic of streams with differing flow status (perennial, intermittent, ephemeral, wash) we might model how soil, air temperature, and precipitation, topographic position, and projected flow status would change under certain climate scenarios. We might use a space-for-time approach to link existing riparian vegetation characteristics with flow status, and develop a simplified set of state transition rules to predict general future conditions. This could be made into a potential change relationship with respect to aquatic/riparian areas (Kumar et al. 2009).
Potential data needs: NHD, NED**,** STASTGO, SSURGO, Climate Change model, PRISM or DAYMET, LANDFIRE vegetation characteristics, human footprint (projected).

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APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive.

CLASS	(Data Entity / Data Element)	Validity	Non-Duplication	Completeness	Relationship Validity	Consistency	Concurrency	Timeliness	Spatial Accurate	Thematic Accuracy	Precision	Derivation Integrity	Confidence Rating Total:	Data Layer Description	Created by	Publication Year	Metadata	COP/SOD extent coverage (full/partial/none)	Data Source Layer Link
LOCATION	NLCD Landcover 2001, Canopy, Impervious	3	4	4	0	0	0	0	3	3	3	2	**22**	Multi-Resolution Land Characteristics Consortium (MRLC)		2001	Y	full	http://www.mrlc.gov/nlcd_multizone_map.php
TRANSPORTATION	Roads - Tiger	3	2	1	1	2	1	1	1	2	0	1	**15**	ROADS	TIGER	2009	y	full	http://www.census.gov/geo/www/tiger/index.html
TRANSPORTATION	2010 Roads - ESRI Dataset	4	4	3	4	2	3	3	3	2	2	3	**33**	ROADS	ESRI StreetMaps Premium	2009	y	full	http://www.esri.com/data/streetmap/index.html
AGRICULTURE	2009 Cropland Data Layer - USDA	4	4	3	3	2	3	4	4	4	3	2	**36**	2009 Cropland Data Layer	USDA	2009	Y	full	http://www.nass.usda.gov/research/Cropland/SARS1a.htm
AGRICULTURE	2010: Agriculture Census of the United States by county - USDA	4	4	3	4	4	0	0	4	4	4	0	**31**	Agriculture Census of the United States by county	U.S. Department of Agriculture (USDA) National Agricultural Statistics Service (NASS)	40330	y		http://www.nationalatlas.gov/mld/agcn07.html
TRANSPORTATION	Road Density in the USA - USGS	2	1	0	1	1	0	0	3	1	1	1	**11**	Road Density in the US	US Dept. of Commerce	1998	Y	full	http://dmsp.ngdc.noaa.gov/html/download_sprawl.html
ENERGY	Oil/Gas - BLM	0	3	3	1		3	3	2	4	3	4	**26**	Oil/Gas	BLM Oil Shale and Tar Sands Programmatic EIS Information Center	1980?	N	WY, CO, UT	http://www.census.gov/geo/www/tlmetadata/tl98meta.txt

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	(Data Entity / Data Element)	Validity	Non-Duplication	Completeness	Relationship Validity	Consistency	Concurrency	Timeliness	Spatial Accurate	Thematic Accuracy	Precision	Derivation Integrity	Confidence Rating Total:	Data Layer Description	Created by	Publication Year	Metadata	COP/SOD extent coverage (full/partial/none)	Data Source Layer Link
ENERGY	EPCA3 - BLM GIS Data	2	0	2	1	1	0	2	0	0	0	0	**8**	EPCA3	BLM Energy Policy and Conservation Act (EPCA) Phase III Inventory GIS Data	current?	N	none	http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/EPCA_III/EPCA_III_geodata.html
ENERGY	Detailed Oil & Gas Field Maps - US Energy Info. Administration	4	4	3	3	3	2	2	4	4	3	3	**35**	Detailed oil & gas field maps	U.S. Energy Information Administartion	current?	y	yes, if geographically relevant	http://www.eia.doe.gov/pub/oil_gas/natural_gas/analysis_publications/maps/maps.htm#geodata
MINING	Mineral Resource Data System - USGS	4	2	4	3	3	2	1	2	2	3	4	**30**	Mineral Resource Data System	USGS Mineral Resources On-Line Spatial Data	current?	y	full	http://tin.er.usgs.gov/mrds/
TRANSPORTATION	2005 Railroads - National Atlas of the United States	4	1	4	1	3	3	2	2	2	2	3	**27**	Railroads	National Atlas of the United States	38596	y	full	http://www.nationalatlas.gov/atlasftp.html?openChapters=chpclim%2Cchptrans#chptrans
TRANSPORTATION	2006 US Roads - National Atlas of the United States	3	2	4	2	3	3	3	3	3	3	2	**31**	US Roads	National Atlas of the United States	39022	y	full	http://www.nationalatlas.gov/atlasftp.html?openChapters=chpclim%2Cchptrans#chptrans

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	(Data Entity / Data Element)	Validity	Non-Duplication	Completeness	Relationship Validity	Consistency	Concurrency	Timeliness	Spatial Accurate	Thematic Accuracy	Precision	Derivation Integrity	Confidence Rating Total:	Data Layer Description	Created by	Publication Year	Metadata	COP/SOD extent coverage (full/partial/none)	Data Source Layer Link
LOCATION	Mountain Pine Beetle mortality in the western US - USDA Forest Service	2	2	3	2	1	3	4	1	3	1	2	**24**	Mountain Pine Beetle mortality in the western US	USDA Forest Service, Forest Health Technology Enterprise Team (FHTET)	1997 – 2008	y	full	http://www.fs.fed.us/foresthealth/technology/adsm.shtml
LOCATION	NLCD Landcover 1992	3	4	3	0	0	0	0	3	3	3	3	**22**	NLCD Landcover 1992	Multi-Resolution Land Characteristics Consortium (MRLC)	1992	Y	full	http://www.mrlc.gov/index.php
MISC	Jornada Basin GIS Layers	4	4	4	0	0	0	0	3	3	3	2	**23**	Jornada Basin GIS Layers	USDA ARS Jornada Experimental Range	38868	Y	full	http://jornada-www.nmsu.edu/gis/giscat.php
MISC	GIS Database for the State	3	2	3	0	0	0	0	3	3	2	2	**18**	GIS Database for the State	Utah's State Geographic Information Database: Utah Government	2010	Y	full	http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layers-by-name
VEGETATION	LANDFIRE data layers	4	3	4	4	4	4	4	4	4	4	4	**43**	LANDFIRE data layers	USDA FS, DOI	2004 - 2009	Y	full	http://www.landfire.gov/
VEGETATION	SWReGAP	4	4	4	0	0	0	0	3	4		3	**22**	SWReGAP	A multi-institutional cooperative effort to map and assess biodiversity for a five-state region; USGS coordination; AR, CO, NE, NM, UT	2003-2005	Y	full	http://fws-nmcfwru.nmsu.edu/swregap/default.htm

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	(Data Entity / Data Element)	Validity	Non-Duplication	Completeness	Relationship Validity	Consistency	Concurrency	Timeliness	Spatial Accurate	Thematic Accuracy	Precision	Derivation Integrity	Confidence Rating Total:	Data Layer Description	Created by	Publication Year	Metadata	COP/SOD extent coverage (full/partial/none)	Data Source Layer Link
RANGE	Ranges of tree species in North America	3	1	4	0	0	0	0	3	3	3	2	**19**	Ranges of tree species in North America	USGS Geology and Environmental Change Science Center	1999	Y	full	http://esp.cr.usgs.gov/data/atlas/little/
RANGE	Digital Distribution Maps of the Mammals of the Western Hemisphere Version 3.0	4	2	4	0	0	0	0	1	2	2	2	**17**	Digital Distribution Maps of the Mammals of the Western Hemisphere Version 3.0	NatureServe	2003	Y	full (Updates as needed)	http://www.natureserve.org/getData/animalData.jsp
RANGE	SWReGAP Project Data (Landcover, Elevation, Slope, Aspect, Distance to Water, landform, Soils, Hydro, & Mountains)	3	2	3	0	0	0	2	3	3	3	3	**22**	SWReGAP Project Data (Landcover, Elevation, Slope, Aspect, Distance to Water, landform, Soils, Hydro, & Mountains)	USGS - Gap Project	2005	Y	full	http://fws-nmcfwru.nmsu.edu/swregap/habitatreview/model_attributes.htm

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	(Data Entity / Data Element)	Validity	Non-Duplication	Completeness	Relationship Validity	Consistency	Concurrency	Timeliness	Spatial Accurate	Thematic Accuracy	Precision	Derivation Integrity	Confidence Rating Total:	Data Layer Description	Created by	Publication Year	Metadata	COP/SOD extent coverage (full/partial/none)	Data Source Layer Link
HABITAT	GIS Hunting Data: Habitat, Endangered Species, Boundaries, & Misc. Data	2	4	4	0	0	0	0	1	2	2	2	**17**	GIS Hunting Data: Habitat, Endangered Species, Boundaries, & Misc. Data	Utah Division of Wildlife Resources	2010	Y	full	http://dwrcdc.nr.utah.gov/ucdc/DownloadGIS/disclaim.htm
RANGE	Sonoran Desert Conservation Plan Maps - Pima County - PDF	0	0	0	0	0	0	0	0	0	0	0	**0**	Sonoran Desert Conservation Plan Maps - Pima County - PDF	Pima County Government	2010	Y	Partial (Covers only Pima County)	http://www.pima.gov/cmo/sdcp/maps.html
HABITAT	Species and Habitat Summary	2	4	4	0	0	0	0	1	2	2	2	**17**	Species and Habitat Summary	Arizona Department of Transportation	40160	Y	full	http://www.azdot.gov/Highways/OES/AZ_WildLife_Linkages/gis_layers.asp
RANGE	Digital Distribution Maps of the Birds of the Western Hemisphere Version 3.0	4	2	4	0	0	0	0	1	2	2	2	**17**	NatureServe Digital Distribution Maps of the Birds of the Western Hemisphere Version 3.0	Nature Serve	2003	y	full (Updates as needed)	http://www.natureserve.org/getData/animalData.jsp

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	(Data Entity / Data Element)	Validity	Non-Duplication	Completeness	Relationship Validity	Consistency	Concurrency	Timeliness	Spatial Accurate	Thematic Accuracy	Precision	Derivation Integrity	Confidence Rating Total:	Data Layer Description	Created by	Publication Year	Metadata	COP/SOD extent coverage (full/partial/none)	Data Source Layer Link
HABITAT	Priority Conservation Areas in Western North America, Version 1	4	3	4	1	3	4	2	3	3	3	1	**31**	Conservation areas in US Geodatabase	The Nature Conservancy	Dec. 2007	Y	FULL	http://azconservation.org/downloads/multi/category/ecoregional_assessment/
HABITAT	Priority Conservation Areas in Western North America, Version 1	0	0	1	0	0	0	0	0	0	0	0	**1**	Conservation areas in US Geodatabase	Dept of the Interior	39600	Y	FULL	http://pubs.usgs.gov/of/2009/1102/
LOCATION	GC Allotments	2	1	0	0	0	0	0	0	2	1	2	**8**	Park Ranger Database Information	U.S Forest Service	2008	N	Full	unknown
LOCATION	Rangeland Management Allotments & Pastures	3	4	3	3	3	0	3	3	3	3	3	**31**	Rangeland management subunits managed by National Forests	USDA Forest Service, Pacific Southwest Region	Oct. 2008	Y		http://www.fs.fed.us/r5/rsl/clearinghouse/gis-download.shtml#rangemgt
LOCATION	Sensitive Soils	2	1	1	0	0	0	0	1	3	3	1	**12**	Areas where soils are sensitive to erosion and timber management	USDA Forest Service, Pacific Southwest Region - Remote Sensing Lab	Aug. 2006	Y	Full	http://www.fs.fed.us/r5/rsl/projects/frdb/layers/ssoi.html

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	(Data Entity / Data Element)	Validity	Non-Duplication	Completeness	Relationship Validity	Consistency	Concurrency	Timeliness	Spatial Accurate	Thematic Accuracy	Precision	Derivation Integrity	Confidence Rating Total:	Data Layer Description	Created by	Publication Year	Metadata	COP/SOD extent coverage (full/partial/none)	Data Source Layer Link
LOCATION	USA Recreation Facilities	3	1	2	0	1	2	2	3	3	3	2	**22**	Recreation Facilities: Forest-oriented recreational facilities such as campgrounds, picnic areas, trailheads, and Forest Service offices. The planned future source is Infra Structures.	USDA Forest Service	2010	Y	Partial	http://fsgeodata.fs.fed.us/vector/index.html
LOCATION	Native Western Fishes	0	1	0	0	0	0	0	0	0	0	0	**1**	Database of Native Western US Fishes	unknown	2006	N	None	unknown
ENERGY	Westwide Energy Cooridoor - CA	3	3	4	3	4	0	4	3	3	3	3	**33**	Developed to support the Final Programmatic Environmental Impact Statement	Argonne National Laboratory	2008	Y	Full	http://fsgeodata.fs.fed.us/vector/index.html

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	(Data Entity / Data Element)	Validity	Non-Duplication	Completeness	Relationship Validity	Consistency	Concurrency	Timeliness	Spatial Accurate	Thematic Accuracy	Precision	Derivation Integrity	Confidence Rating Total:	Data Layer Description	Created by	Publication Year	Metadata	COP/SOD extent coverage (full/partial/none)	Data Source Layer Link
WILDFIRE	Wildland & Urban Intermix	2	0	1	0	0	0	0	3	3	1	0	**10**	Used for National Forest planning and assessment and other natural resource applications.	Remote Sensing Lab, Region 5, USDA Forest Service	2006	Y	Full	http://www.fs.fed.us/r5/rsl/clearinghouse/gis-download.shtml
SITES	Research Natural Areas: Region 1-4	0	1	0	0	0	0	0	1	2	1	2	**7**	Natural Research Areas and regions associated with locations	USDA Forest Service	unknown	N	None	unknown
INVASIVE SPECIES	Annual Grass Index	4	3	4	1	4	2	3	3	3	4	3	**34**	Annual Grass Index (ANGRIN) derived from multitemporal Landsat 5 TM and MODIS Imagery with statistical models utilizing 806 training sites.	Eric B. Peterson, Nevada Natural Heritage Program	38807	Y	Full	http://heritage.nv.gov

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	(Data Entity / Data Element)	Validity	Non-Duplication	Completeness	Relationship Validity	Consistency	Concurrency	Timeliness	Spatial Accurate	Thematic Accuracy	Precision	Derivation Integrity	Confidence Rating Total:	Data Layer Description	Created by	Publication Year	Metadata	COP/SOD extent coverage (full/partial/none)	Data Source Layer Link
HABITAT	Black Tailed Prairie Dog	3	1	3	1	3	0	3	1	1	1	1	**18**	All historic and current occupied and unoccupied Black-tailed Prairie Dog colony polygons acquired		37681	Y	Partial, Incomplete Dataset	unknown
ENERGY	Oil/GAS Database for EPCA	4	3	4	3	3	3	4	3	3	3	4	**37**	Inventory of Onshore Federal Oil & Natural Gar Resources & Restrictions to their Develioment	US Dept of Interior, Agriculture, & Energy	2008	N	Partial, Incomplete Dataset	http://www.blm.gov/epca/
ENERGY	Uinta Piceance Basin	4	4	4	3	3	2	4	3	3	3	4	**37**	Inventory of Onshore Federal Oil & Natural Gar Resources & Restrictions to their Develioment	US Dept of Interior, Agriculture, & Energy	2008	N	Partial, Incomplete Dataset	http://www.blm.gov/epca/
ENERGY	EPCA DATABASE	4	3	4	3	3	3	4	3	3	3	4	**37**	Data Layers to properly assess the amount of oil / gas product available	USGS	2006	Y	Complete	http://certmapper.cr.usgs.gov/noga/servlet/NogaGISResultsServ?subtheme=05&page=gis&vintage=2000

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	(Data Entity / Data Element)	Validity	Non-Duplication	Completeness	Relationship Validity	Consistency	Concurrency	Timeliness	Spatial Accurate	Thematic Accuracy	Precision	Derivation Integrity	Confidence Rating Total:	Data Layer Description	Created by	Publication Year	Metadata	COP/SOD extent coverage (full/partial/none)	Data Source Layer Link
ENERGY	Phase III - EPCA Report	0	0	0	0	0	0	0	0	0	0	0	**0**	Energy Policy and Conservation Act document recording the Federal Oil and Gas resources located on the entire onshore United States	BLM-EPCA	2008	N	None	unknown
ENERGY	Solar Energy Study Areas for the Bureau of Land Management	4	2	3	2	3	2	4	2	2	2	3	**29**	Data has been developed for use in maps and tables supporting the Solar Energy PEIS.	BLM-PEIS	39969	Y	Partial, In work	http:\\solareis.anl.gov

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	(Data Entity / Data Element)	Validity	Non-Duplication	Completeness	Relationship Validity	Consistency	Concurrency	Timeliness	Spatial Accurate	Thematic Accuracy	Precision	Derivation Integrity	Confidence Rating Total:	Data Layer Description	Created by	Publication Year	Metadata	COP/SOD extent coverage (full/partial/none)	Data Source Layer Link
LOCATION	Surface Management Data Layer	4	2	3	4	3	4	3	3	3	3	2	**34**	A "Surface Management Agency" data layer portrays tracts of federal land for the United States and classifies these holdings by administrative agency	Compiled and maintained by the Dept. of the Interior, BLM, National Operations Center, National Applications Office, National Integrated Lands (NILS) Project	40070	Y	Partial, In work	http://www.geocommunicator.gov
BOUNDARIES	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Admin Boundaries - (COD, SOP)	Bureau of Land Management	8/30/2010	Y	full	ftp://ftp.blm.gov/pub/

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	(Data Entity / Data Element)	Validity	Non-Duplication	Completeness	Relationship Validity	Consistency	Concurrency	Timeliness	Spatial Accurate	Thematic Accuracy	Precision	Derivation Integrity	Confidence Rating Total:	Data Layer Description	Created by	Publication Year	Metadata	COP/SOD extent coverage (full/partial/ none)	Data Source Layer Link
BOUNDARIES	na	na	na	na	na	na	na	na	na	na	na	na	**na**	County Boundaries - (COP, SOD)	Bureau of Land Management	9/24/2010	Y (Limited)	full	ftp://ftp.blm.gov/pub/
BOUNDARIES	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Surface Management Agency (SMA) - Clip of COP, SOD	From BLM Server	9/25/2010	Y (Limited)	Partial	unknown
ELEVATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Elevation - National Elevation Dataset (NED)	U.S Geological Survey	2009	Y	full	http://seamless.usgs.gov
ELEVATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Elevation - National Elevation Dataset (NED)	U.S Geological Survey	2009	Y	full	http://seamless.usgs.gov
ELEVATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Elevation Derivatives for National Applications (EDNA)	USGS - (USGS EROS, USGS/NMD, USGS/WRD, NSSL, & EPA)	2006	Y	Complete	http://gisdata.usgs.net/ned

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ENERGY	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Energy Leases - Coal, Geothermal, OG, Solar, and Wind	From BLM Server	9/24/2010	Y (Limited)	full	http://www.blm.gov/nils/GeoComm/home_services.html
ENERGY	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Oil & Gas Leases - AZ,CA,CO,NM, UT, and Whole USA	From BLM Server	9/24/2010	Y (Limited)	Full	unknown
AGRICULTURE	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Agriculture Census, by county	National Atlas of the United States, Agriculture Census of the United States - 2002	2007, created in 2010	y	unknown	http://nationalatlas.gov/atlasftp.html
WATER	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Estimated use of water in the United States by County	U.S Geological Survey	Sep-05	Y	Full	http://nationalatlas.gov/atlasftp.html?openChapters=chpwater#chpwater
PLANNING	na	na	na	na	na	na	na	na	na	na	na	na	**na**	LUPA (Land Use Planning)	Bureau of Land Management	Sep-07	Y	Full	http://www.blm.gov/co/st/en/BLM_Programs/geographical_sciences/gis/metadata.html
URBAN	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Census Data (1990 & 2000)	U.S Geological Survey	Jun-05	Y	Full	http://nationalatlas.gov/atlasftp.html

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

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URBAN	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Cities and Towns of the United States	USGS - National Atlas of the United States	Feb-04	Y	Full	http://www.itl.nist.gov/fipspubs/55new/nav-top-fr.htm
URBAN	na	na	na	na	na	na	na	na	na	na	na	na	**na**	North American Atlas - Populated Places	USGS, Government of Canado, Natural Resources Canado, The Atlas of Canada, & Instituto Nacional de Estadística Geografía e Informática	2005	Y	Full	http://nationalatlas.gov/atlasftp.html
ENERGY	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Alternative Fuels	National Renewable Energy Laboratory	2009	Y	Full	http://www.bts.gov/programs/geographic_information_services
TRANSPORTATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Amtrak Stations	Federal Railroad Admininistration (FRA)	Mar-09	Y	Full	http://www.amtrak.com
TRANSPORTATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Automatic Traffic Recorder (ATR) Stations	Research and Innovative Technology Administration's Bureau of Transportation Statistics (RITA/BTS)	2006	Y	full	http://www.bts.gov/programs/geographic_information_services/
TRANSPORTATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Version 2004 of the Fixed-Guideway Transit Network	Federal Transit Administration (FTA)	2004	Y	full	http://www.bts.gov/programs/geographic_information_services/

- Lines

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CLASS	(Data Entity / Data Element)	Validity	Non-Duplication	Completeness	Relationship Validity	Consistency	Concurrency	Timeliness	Spatial Accurate	Thematic Accuracy	Precision	Derivation Integrity	Confidence Rating Total:	Data Layer Description	Created by	Publication Year	Metadata	COP/SOD extent coverage (full/partial/none)	Data Source Layer Link
TRANSPORTATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Version 2004 of the Fixed-Guideway Transit Network - Points	Federal Transit Administration (FTA)	2004	Y	full	http://www.bts.gov/programs/geographic_information_services/
TRANSPORTATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Freight Analysis Network Framework (FAF) - Transportation	Federal Highway Administration Office of Freight Management and Operations	2009	Y	Planned (update as needed)	http://www.bts.gov/programs/geographic_information_services/
TRANSPORTATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	US Hazardous Materials Routes (Lines and Tables)	Federal Motor Carrier Safety Administration - Research and Innovative Technology Administration's Bureau of Transportation Statistics (RITA/BTS)	2009	Y	Planned (update as needed)	http://hazmat.fmcsa.dot.gov/nhmrr/index.asp
TRANSPORTATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Highway Performance Monitoring System	The Federal Highway Administration (FHWA)	2009	Y	Partial (updated Annually)	http://www.fhwa.dot.gov/ohim/hpmsmanl/hpms.htm

TRANSPORTATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Highway Rail Grade Crossings	Federal Railroad Administration (FRA)	Mar-09	Y	Planned (update as needed)	http://safetydata.fra.dot.gov/officeofsafety/Downloads/Default.asp

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CLASS	**(Data Entity / Data Element)**	**Validity**	**Non-Duplication**	**Completeness**	**Relationship Validity**	**Consistency**	**Concurrency**	**Timeliness**	**Spatial Accurate**	**Thematic Accuracy**	**Precision**	**Derivation Integrity**	**Confidence Rating Total:**	**Data Layer Description**	**Created by**	**Publication Year**	**Metadata**	**COP/SOD extent coverage (full/partial/none)**	**Data Source Layer Link**
TRANSPORTATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Intermodal Terminal Facilities	Research and Innovative Technology Administration's Bureau of Transportation Statistics (RITA/BTS)	2003	Y	Planned (update as needed)	http://www.bts.gov/programs/geographic_information_services/
TRANSPORTATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	National Bridge Inventory	Federal Highway Administration (FHWA)	2009	Y	Partial (updated Annually)	http://www.fhwa.dot.gov/
TRANSPORTATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	National Highway Planning Network - (Points and Polylines)	Federal Highway Administration (FHWA)	2009	Y	Planned (update as needed)	http://www.fhwa.dot.gov/
TRANSPORTATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Public Use Airport Runways	Research and Innovative Technology Administration's Bureau of Transportation Statistics (RITA/BTS)	2009	Y	Complete (Data updated annually)	http://www.bts.gov/gis/
TRANSPORTATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Public Use Airports	Research and Innovative Technology Administration's Bureau	2009	Y	Complete (Data updated annually)	http://www.bts.gov/gis/

														of Transportation Statistics (RITA/BTS)				
TRANSPORTATION	na	na	na	na	na	na	na	na	na	na	na	**na**	Rail Network - Lines and Points	Federal Railroad Administration (FRA)	2009	Y	Complete (Data updated annually)	http://gis.fra.dot.gov

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	**(Data Entity / Data Element)**	**Validity**	**Non-Duplication**	**Completeness**	**Relationship Validity**	**Consistency**	**Concurrency**	**Timeliness**	**Spatial Accurate**	**Thematic Accuracy**	**Precision**	**Derivation Integrity**	**Confidence Rating Total:**	**Data Layer Description**	**Created by**	**Publication Year**	**Metadata**	**COP/SOD extent coverage (full/partial/none)**	**Data Source Layer Link**
TRANSPORTATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	The National Waterway Network (Lines and Points)	Research and Innovative Technology Administration's Bureau of Transportation Statistics (RITA/BTS)	2009	Y	Partial (updated continually)	http://www.bts.gov/programs/geographic_information_services/
TRANSPORTATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Railroads	USGS, Government of Canado, Natural Resources Canado, The Atlas of Canada, & Instituto Nacional de Estadística Geografía e Informática	Jun-04	Y	Complete (Data updated irregularly)	http://nationalatlas.gov/atlasftp.html
DEVELOPMENT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Communication Data (Point Data) - 22 Files with NO metadata or update information	unknown	Unkn	N	unknown	unknown

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ENERGY	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Programmatic Environmental Impact Statement - Designation of Energy Corridors on Federal Land in 11 Western States Data	Argonne National Laboratory	Nov-08	Y	Complete	http://corridoreis.anl.gov/eis/fmap/index.cfm
ENERGY	na	na	na	na	na	na	na	na	na	na	na	na	**na**	EV Energy Map - Electric Plants Layer (Points, Lines, and Polygons)	Global Energy	Sep-05	Y	Partial (updated continually)	unknown
ENERGY	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Regions of Known Potential Geothermal Resources	Idaho National Engineering & Environmental Laboratory	Nov-03	Y	Complete	https://inlportal.inl.gov/portal/server.pt?open=512&objID=422&parentname=CommunityPage&parentid=14&mode=2

ENERGY	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Solar Energy Study Area	Bureau of Land Management	6/5/2009	Y	Partial (update as needed)	http://solareis.anl.gov
ENERGY	na	na	na	na	na	na	na	na	na	na	na	na	**na**	FEMA Transmission Lines	Federal Emergency Management Agency	1993ish?	N	unknown	FEMA?

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	**(Data Entity / Data Element)**	**Validity**	**Non-Duplication**	**Completeness**	**Relationship Validity**	**Consistency**	**Concurrency**	**Timeliness**	**Spatial Accurate**	**Thematic Accuracy**	**Precision**	**Derivation Integrity**	**Confidence Rating Total:**	**Data Layer Description**	**Created by**	**Publication Year**	**Metadata**	**COP/SOD extent coverage (full/partial/none)**	**Data Source Layer Link**
LOCATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Land Cover Change (CA, OR, & WASH)	Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Coastal Services Center (CSC)	Sep-09	Y	full	http://www.csc.noaa.gov/
URBAN	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Nighttime Lights of North America	National Geophysical Data Center	Jan-03	Y	Complete (update as needed)	http://nationalatlas.gov/atlasftp.html
DEVELOPMENT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	The Human Footprint in the West	Matthias Leu, Steve Hanser, and Steve Knick, USGS-FRESC, Snake River Field Station	Jun-05	Y	Complete	http://sagemap.wr.usgs.gov/

ENERGY	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Biomass Resource Potential for the lower 48 States (2005 & 2008)	Anelia Milbrandt - National Renewable Energy Laboratory (NREL)	Sept. 2005 & Sept. 2009	N	Complete	http://128.118.47.58/uci/SearchResults.aspx?originator=National%20Renewable%20Energy%20Laboratory%20%28NREL%29&Keyword=&searchType=originator&entry=PASDA&sessionID=400371744201092714331
ENERGY	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Solar Resource Potential for 48 Contiguous United States	SUNY Albany and NREL	01/01/1998 - 12/31/2005	Y	Complete	http://www.nrel.gov/gis/solar.html

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	**(Data Entity / Data Element)**	**Validity**	**Non-Duplication**	**Completeness**	**Relationship Validity**	**Consistency**	**Concurrency**	**Timeliness**	**Spatial Accurate**	**Thematic Accuracy**	**Precision**	**Derivation Integrity**	**Confidence Rating Total:**	**Data Layer Description**	**Created by**	**Publication Year**	**Metadata**	**COP/SOD extent coverage (full/partial/none)**	**Data Source Layer Link**
ENERGY	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Wind Resources and Maps for 28 Contiguous States	National Renewable Energy Laboratory (NREL)	Aug. 13, 2003	N	Complete	http://www.nrel.gov/gis/wind.html
AQUIFERS	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Aquifers of the 48 Conterminous US States	U.S Geological Survey	Oct-03	Y	Full	http://nationalatlas.gov/atlasftp.html
AQUIFERS	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Groundwater Climate Response Network	U.S Geological Survey	Jun-05	Y	Full	http://nationalatlas.gov/atlasftp.html
LOCATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	National Soil Information System (NASIS)	USDA, US Department of Agriculture	7/5/2006	Y	Full	http://SoilDataMart.nrcs.usda.gov

														- General Soils Map STATSGO2					
VEGETATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Northwest Gap Analysis Project	United States Geological Survey, EROS Data Center, National Elevation Dataset	Sep-04	Y	Complete	http://gap.uidaho.edu/index.php/gap-home/Northwest-GAP
VEGETATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Southwest Gap Analysis Project	United States Geological Survey, EROS Data Center, National Elevation Dataset	Sep-04	Y	Complete	http://earth.gis.usu.edu/swgap/

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	**(Data Entity / Data Element)**	**Validity**	**Non-Duplication**	**Completeness**	**Relationship Validity**	**Consistency**	**Concurrency**	**Timeliness**	**Spatial Accurate**	**Thematic Accuracy**	**Precision**	**Derivation Integrity**	**Confidence Rating Total:**	**Data Layer Description**	**Created by**	**Publication Year**	**Metadata**	**COP/SOD extent coverage (full/partial/none)**	**Data Source Layer Link**
GRAZING	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Grazing Allotments (Clip for SOD, COP)	unknown	unknown	N	unknown	unknown
LOCATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	BBS Grid: Bird Breeding Survey, Bird Counts, Bird Occurances (COP, SOD CLIP)	USGS Patuxent Wildlife Research Center	2004	Y	full	ftp://ftpext.usgs.gov/pub/er/md/laurel/BBS/DataFiles/
LOCATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	NABBS 2003 - Version 2004.1 (Clip COP, SOD)	USGS Patuxent Wildlife Research Center	2004	Y	full	http//www.mp2-pwrc.usgs.gov/bbs/

HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Gunnison's Sage Grouse Brood Area	Colorado Division of Wildlife	2009	Y	Partial, In work	http://ndis.nrel.colostate.edu/ftp/ftp_response.asp
HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Gunnison's Sage Grouse Historical Habitat	Colorado Division of Wildlife	2009	Y	Partial, In work	http://ndis.nrel.colostate.edu/ftp/ftp_response.asp
HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Gunnison's Sage Grouse Overall Range	Colorado Division of Wildlife	2009	Y	Partial, In work	http://ndis.nrel.colostate.edu/ftp/ftp_response.asp

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	**(Data Entity / Data Element)**	**Validity**	**Non-Duplication**	**Completeness**	**Relationship Validity**	**Consistency**	**Concurrency**	**Timeliness**	**Spatial Accurate**	**Thematic Accuracy**	**Precision**	**Derivation Integrity**	**Confidence Rating Total:**	**Data Layer Description**	**Created by**	**Publication Year**	**Metadata**	**COP/SOD extent coverage (full/partial/none)**	**Data Source Layer Link**
HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Gunnison's Sage Grouse Production Area	Colorado Division of Wildlife	2009	Y	Partial, In work	http://ndis.nrel.colostate.edu/ftp/ftp_response.asp
HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Gunnison's Sage Grouse Severe Winter Range	Colorado Division of Wildlife	2009	Y	Partial, In work	http://ndis.nrel.colostate.edu/ftp/ftp_response.asp
HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Gunnison's Sage Grouse Winter Range	Colorado Division of Wildlife	2009	Y	Partial, In work	http://ndis.nrel.colostate.edu/ftp/ftp_response.asp
HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Gunnison's Sage Grouse Habitat Range	NatureServe	2007	Y	Full	http://www.natureserve.org/getData/birdMaps.jsp

HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Gunnison's Sage Grouse - Occupied Habitat Status	Colorado Division of Wildlife	Mar-04	Y	Partial, In work	http://ndis.nrel.colostate.edu/ftp/ftp_response.asp
HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Gunnison's Sage Grouse - Utah	The State of Utah School and Institutional Trust Lands Administration, The Bureau of Land Management	2008	Y	Partial, In work	http://www.blm.gov/ut/st/en/prog/more/geographic_information/gis_data_and_maps.html
LOCATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	RMBO - point transects 1998 to 2009	Rocky Mountain Bird Observatory	6/21/2010	Y	full	http://www.rmbo.org/public/monitoring/downloads.aspx

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	**(Data Entity / Data Element)**	**Validity**	**Non-Duplication**	**Completeness**	**Relationship Validity**	**Consistency**	**Concurrency**	**Timeliness**	**Spatial Accurate**	**Thematic Accuracy**	**Precision**	**Derivation Integrity**	**Confidence Rating Total:**	**Data Layer Description**	**Created by**	**Publication Year**	**Metadata**	**COP/SOD extent coverage (full/partial/none)**	**Data Source Layer Link**
HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Mule Deer Covers - Class A	unknown	None	N	N/A	unknown
HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Mule Deer Covers - Class B	unknown	None	N	N/A	unknown
HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Mule Deer Covers - Class C	unknown	None	N	N/A	unknown
HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Mule Deer Covers - Class D	unknown	None	N	N/A	unknown
HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Mule Deer Covers - Class E	unknown	None	N	N/A	unknown

HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Mule Deer Covers - Class F	unknown	None	N	N/A	unknown
HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	New Mexico Mule Deer Cover	unknown	None	N	N/A	unknown
HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	US Mule Deer Cover	unknown	1980?	N	N/A	unknown

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	**(Data Entity / Data Element)**	**Validity**	**Non-Duplication**	**Completeness**	**Relationship Validity**	**Consistency**	**Concurrency**	**Timeliness**	**Spatial Accurate**	**Thematic Accuracy**	**Precision**	**Derivation Integrity**	**Confidence Rating Total:**	**Data Layer Description**	**Created by**	**Publication Year**	**Metadata**	**COP/SOD extent coverage (full/partial/none)**	**Data Source Layer Link**
HABITAT	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Critical Habitat - Endangered and threatened species	U.S. Fish and Wildlife Service	up to date	Y		http://criticalhabitat.fws.gov/docs/crithab/crithab_all_layers.zip
LOCATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Protected Areas of the US (PADUS) - Clip of SOD & COP	US National Gap Analysis Program	4/9/2009	Y	Planned (update as needed)	http://www.protectedlands.net/padus/preview.php
STREAMS	na	na	na	na	na	na	na	na	na	na	na	na	**na**	National Hydrography Dataset(NHD	U.S Geological Survey	5/12/2007	Y	Full	http://nhdgeo.usgs.gov/viewer.htm

														Model)					
STREAMS	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Watershed Boundary Datasets (WBD)	USDA, NRCS - National Resources Conservation Service	May-02	Y	Full	http://datagateway.nrcs.usda.gov
LOCATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	NWI - Arizona - Wetland Polygon	U.S. Fish and Wildlife Service	9/25/2009	Y	Full	http://www.fws.gov/wetlands/
LOCATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	NWI - Arizona - Historic Map Info.	U.S. Fish and Wildlife Service	9/26/2009	Y	Full	http://www.fws.gov/wetlands/

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	**(Data Entity / Data Element)**	**Validity**	**Non-Duplication**	**Completeness**	**Relationship Validity**	**Consistency**	**Concurrency**	**Timeliness**	**Spatial Accurate**	**Thematic Accuracy**	**Precision**	**Derivation Integrity**	**Confidence Rating Total:**	**Data Layer Description**	**Created by**	**Publication Year**	**Metadata**	**COP/SOD extent coverage (full/partial/none)**	**Data Source Layer Link**
LOCATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	NWI - Colorado - Wetland Polygon Info.	U.S. Fish and Wildlife Service	9/29/2009	Y	Full	http://www.fws.gov/wetlands/
LOCATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	NWI - Colorado - Historic Map Info	U.S. Fish and Wildlife Service	9/30/2009	Y	Full	http://www.fws.gov/wetlands/
LOCATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	NWI - New Mexico - Wetland	U.S. Fish and Wildlife Service	10/3/2009	Y	Full	http://www.fws.gov/wetlands/

LOCATION	na	na	na	na	na	na	na	na	na	na	na	**na**	Polygon Info. NWI - New Mexico - Historic Map Info	U.S. Fish and Wildlife Service	10/4/2009	Y	Full	http://www.fws.gov/wetlands/

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	**(Data Entity / Data Element)**	**Validity**	**Non-Duplication**	**Completeness**	**Relationship Validity**	**Consistency**	**Concurrency**	**Timeliness**	**Spatial Accurate**	**Thematic Accuracy**	**Precision**	**Derivation Integrity**	**Confidence Rating Total:**	**Data Layer Description**	**Created by**	**Publication Year**	**Metadata**	**COP/SOD extent coverage (full/partial/none)**	**Data Source Layer Link**
LOCATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	NWI - Utah - Wetland Polygon Info.	U.S. Fish and Wildlife Service	10/9/2009	Y	Full	http://www.fws.gov/wetlands/

LOCATION	na	na	na	na	na	na	na	na	na	na	na	**na**	NWI - Utah - Historic Map Info	U.S. Fish and Wildlife Service	10/10/2009	Y	Full		http://www.fws.gov/wetlands/

APPENDIX 11. Preliminary data source evaluation results as of 10-13-2010. Evaluation results "na" signify data delivered on the BLM hard drive. (Continued …)

CLASS	**(Data Entity / Data Element)**	**Validity**	**Non-Duplication**	**Completeness**	**Relationship Validity**	**Consistency**	**Concurrency**	**Timeliness**	**Spatial Accurate**	**Thematic Accuracy**	**Precision**	**Derivation Integrity**	**Confidence Rating Total:**	**Data Layer Description**	**Created by**	**Publication Year**	**Metadata**	**COP/SOD extent coverage (full/partial/none)**	**Data Source Layer Link**

LOCATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	MTBS Fire Occurance Shapefile - Clip of SOD & COP	Monitoring Trends in Burn Severity Project	2/24/2009	Y	Full	http://mtbs.gov/dataquery/individualfiredata.html
LOCATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	MTBS Fire Perimeters Shapefile - Clip of SOD & COP	Monitoring Trends in Burn Severity Project	2/24/2009	Y	Full	http://mtbs.gov/dataquery/individualfiredata.html
LOCATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Wildland Urban Interface Shapefile - COP & SOD	unknown	Unknown	N	Unknown	Unknown
LOCATION	na	na	na	na	na	na	na	na	na	na	na	na	**na**	Burn Severity Image Mosaics (Alaska, North Central, PAC West, PAC SW, South Central, & SW)	?	2009	N	?	No Source

APPENDIX 12. Preliminary datasets for potential inclusion in Human Footprint layers for the Colorado Plateau REA. Files related to conventional or renewable energy development are flagged, as are conditional footprint layers. Conditional footprint layers may or may not be included in the footprint, depending on species conservation element sensitivity to this class of disturbance.

CONDITIONAL FOOTPRINT	ENERGY RELATED	FILE_NAME	FILE_LOCATION	NOTES
YES		2010 Roads - ESRI Dataset		
YES		2005 Railroads - National Atlas of the United States	National Atlas of the United States	
YES		2006 US Roads - National Atlas of the United States	National Atlas of the United States	
YES	YES	FEMA Transmission Lines	BLM hard drive	Federal Emergency Management Agency
YES	YES	BLM_MAP_ROW	http://www.blm.gov/nils/GeoComm/home_services.html)	
YES	YES	Energy Corridors	http://solareis.anl.gov/eis/maps/index.cfm	
YES	YES	Market significant transmission lines in North America.	http://www.globalenergymaps.com/ or R:\wildlifei\data_105\energy_dev\grsgmdl06_inputs\globalenergy\GE_Data_09-28-05	
YES	YES	Transmission Lines	http://www.nrel.gov/gis/data_analysis.html	
YES		All Roads in the Western United States	http://sagemap.wr.usgs.gov/HumanFootprint.aspx	

APPENDIX 12. (Continued) Preliminary datasets for potential inclusion in Human Footprint layers for the Colorado Plateau REA.

CONDITIONAL FOOTPRINT	ENERGY RELATED	FILE_NAME	FILE_LOCATION	NOTES
YES		Ass Secondary Roads in the the Western United States	http://sagemap.wr.usgs.gov/HumanFootprint.aspx	
YES		BLM Linear Features	NOC	
YES		Canals in the Western United States	http://sagemap.wr.usgs.gov/HumanFootprint.aspx	
YES		Density of Line Features in the Western United States	http://sagemap.wr.usgs.gov/HumanFootprint.aspx	
YES		Powerlines in the Western United States	http://sagemap.wr.usgs.gov/HumanFootprint.aspx	
YES		Railroads	http://www.nationalatlas.gov/atlasftp.html?openChapters=chpclim%2Cchptrans#chptrans	
YES		Railroads in the Western United States	http://sagemap.wr.usgs.gov/HumanFootprint.aspx	
YES		Roads	NPScape	
YES		US Roads	http://www.nationalatlas.gov/atlasftp.html?openChapters=chpclim%2Cchptrans#chptrans	
YES		National Railroad Network	http://www.bts.gov/publications/north_american_transportation_atlas_data/	
YES		ESRI StreetMaps Premium	http://www.esri.com/data/streetmap/index.html	

APPENDIX 12. (Continued) Preliminary datasets for potential inclusion in Human Footprint layers for the Colorado Plateau REA.

CONDITIONAL FOOTPRINT	ENERGY RELATED	FILE_NAME	FILE_LOCATION	NOTES
YES		TIGER	http://www.census.gov/geo/www/tiger/index.html	
		NLCD Landcover 2001, Canopy, Impervious		
		NLCD Landcover 1992		
		Road Density in the USA - USGS	US Dept. of Commerce	
	YES	Oil/Gas - BLM	BLM Oil Shale and Tar Sands Programmatic EIS Information Center	
	YES	EPCA3 - BLM GIS Data	BLM Energy Policy and Conservation Act (EPCA) Phase III Inventory GIS Data	
	YES	Detailed Oil & Gas Field Maps - US Energy Info. Administration	U.S. Energy Information Administartion	
		Mineral Resource Data System - USGS	USGS Mineral Resources On-Line Spatial Data	
	YES	Energy Leases - Coal, Geothermal, OG, Solar, and Wind	BLM hard drive	From BLM Server
	YES	Oil & Gas Leases - AZ,CA,CO,NM,UT, and Whole USA	BLM hard drive	From BLM Server

APPENDIX 12. (Continued) Preliminary datasets for potential inclusion in Human Footprint layers for the Colorado Plateau REA.

CONDITIONAL FOOTPRINT	ENERGY RELATED	FILE_NAME	FILE_LOCATION	NOTES
		Agriculture Census, by county	BLM hard drive	National Atlas of the United States, Agriculture Census of the United States - 2002
		North American Atlas - Populated Places	BLM hard drive	USGS, Government of Canado, Natural Resources Canado, The Atlas of Canada, & Instituto Nacional de Estadística Geografía e Informática
	YES	Alternative Fuels	BLM hard drive	National Renewable Energy Laboratory
		Amtrak Stations	BLM hard drive	Federal Railroad Admininistration (FRA)

APPENDIX 12. (Continued) Preliminary datasets for potential inclusion in Human Footprint layers for the Colorado Plateau REA.

CONDITIONAL FOOTPRINT	ENERGY RELATED	FILE_NAME	FILE_LOCATION	NOTES
		Automatic Traffic Recorder (ATR) Stations	BLM hard drive	Research and Innovative Technology Administration's Bureau of Transportation Statistics (RITA/BTS)
		Version 2004 of the Fixed-Guideway Transit Network - Lines	BLM hard drive	Federal Transit Administration (FTA)
		Version 2004 of the Fixed-Guideway Transit Network - Points	BLM hard drive	Federal Transit Administration (FTA)
		Freight Analysis Network Framework (FAF) - Transportation	BLM hard drive	Federal Highway Administration Office of Freight Management and Operations

APPENDIX 12 (Continued) Preliminary datasets for potential inclusion in Human Footprint layers for the Colorado Plateau REA.

CONDITIONAL FOOTPRINT	ENERGY RELATED	FILE_NAME	FILE_LOCATION	NOTES
		US Hazardous Materials Routes (Lines and Tables)	BLM hard drive	Federal Motor Carrier Safety Administration - Research and Innovative Technology Administration's Bureau of Transportation Statistics (RITA/BTS)
		Highway Performance Monitoring System	BLM hard drive	The Federal Highway Administration (FHWA)
		Highway Rail Grade Crossings	BLM hard drive	Federal Railroad Administration (FRA)

APPENDIX 12. (Continued) Preliminary datasets for potential inclusion in Human Footprint layers for the Colorado Plateau REA.

CONDITIONAL FOOTPRINT	ENERGY RELATED	FILE_NAME	FILE_LOCATION	NOTES
		Intermodal Terminal Facilities	BLM hard drive	Research and Innovative Technology Administration's Bureau of Transportation Statistics (RITA/BTS)
		National Bridge Inventory	BLM hard drive	Federal Highway Administration (FHWA)
		National Highway Planning Network - (Points and Polylines)	BLM hard drive	Federal Highway Administration (FHWA)
		Public Use Airport Runways	BLM hard drive	Research and Innovative Technology Administration's Bureau of Transportation Statistics (RITA/BTS)

APPENDIX 12. (Continued) Preliminary datasets for potential inclusion in Human Footprint layers for the Colorado Plateau REA.

CONDITIONAL FOOTPRINT	ENERGY RELATED	FILE_NAME	FILE_LOCATION	NOTES
		Public Use Airports	BLM hard drive	Research and Innovative Technology Administration's Bureau of Transportation Statistics (RITA/BTS)
		Rail Network - Lines and Points	BLM hard drive	Federal Railroad Administration (FRA)
		The National Waterway Network (Lines and Points)	BLM hard drive	Research and Innovative Technology Administration's Bureau of Transportation Statistics (RITA/BTS)

APPENDIX 12. (Continued) Preliminary datasets for potential inclusion in Human Footprint layers for the Colorado Plateau REA.

CONDITIONAL FOOTPRINT	ENERGY RELATED	FILE_NAME	FILE_LOCATION	NOTES
		Communication Data (Point Data) - 22 Files with NO metadata or update information	BLM hard drive	unknown
	YES	Programmatic Environmental Impact Statement - Designation of Energy Corridors on Federal Land in 11 Western States Data	BLM hard drive	Argonne National Laboratory
	YES	EV Energy Map - Electric Plants Layer (Points, Lines, and Polygons)	BLM hard drive	Global Energy
	YES	Regions of Known Potential Geothermal Resources	BLM hard drive	Idaho National Engineering & Environmental Laboratory
	YES	Solar Energy Study Area	BLM hard drive	Bureau of Land Management
	YES	Biomass Resource Potential for the lower 48 States (2005 & 2008)	BLM hard drive	Anelia Milbrandt - National Renewable Energy Laboratory (NREL)

APPENDIX 12. (Continued) Preliminary datasets for potential inclusion in Human Footprint layers for the Colorado Plateau REA.

CONDITIONAL FOOTPRINT	ENERGY RELATED	FILE_NAME	FILE_LOCATION	NOTES
	YES	Solar Resource Potential for 48 Contiguous United States	BLM hard drive	SUNY Albany and NREL
	YES	Wind Resources and Maps for 28 Contiguous States	BLM hard drive	National Renewable Energy Laboratory (NREL)
	YES	BLM_FEATURE_ENERGY_POTENTIAL (NREL Concentrating Solar Power, NREL Photovoltaic Resource Potential, NREL Wind Potential High and Low Resolution, Oil Shale Prospective Areas,and Geothermal Prospective Areas)	http://www.blm.gov/nils/GeoComm/home_services.html)	
	YES	BLM_FEATURE_OIL_AND_GAS (producing and non-producing O&G leases, unit agreements, participating areas, communitization agreements, other agreements, Lease Sale Parcels, O&G Basin Study Areas, Stipulations, Hydrocarbon Leases,)	http://www.blm.gov/nils/GeoComm/home_services.html)	

APPENDIX 12. (Continued) Preliminary datasets for potential inclusion in Human Footprint layers for the Colorado Plateau REA.

CONDITIONAL FOOTPRINT	ENERGY RELATED	FILE_NAME	FILE_LOCATION	NOTES
	YES	BLM_FEATURE_ROW (Fast Track Renewable Energy Projects for solar, wind, and geothermal, Dept. of Defense Airspace Consultation Areas for renewable energy development, Proposed 368 Energy Corridors - centerline and zones, pipelines, power transmission (except solar and wind), roads, communication sites, telephone, railroads,fiber optics, and water facilities)	http://www.blm.gov/nils/GeoComm/home_services.html)	
	YES	BLM_FEATURE_SOLAR_ENERGY (tbd, authorized, and closed solar ROW, Dept. of Defense Airspace Consultation Areas, solar energy study areas, fast track projects)	http://www.blm.gov/nils/GeoComm/home_services.html)	
	YES	BLM_FEATURE_WIND_ENERGY (tbd, authorized, closed wind energy ROW, and fast track projects)	http://www.blm.gov/nils/GeoComm/home_services.html)	
	YES	BLM_MAP_ENERGY_POTENTIAL	http://www.blm.gov/nils/GeoComm/home_services.html)	

APPENDIX 12 (Continued) Preliminary datasets for potential inclusion in Human Footprint layers for the Colorado Plateau REA.

CONDITIONAL FOOTPRINT	ENERGY RELATED	FILE_NAME	FILE_LOCATION	NOTES
	YES	BLM_MAP_GEOTHERMAL	http://www.blm.gov/nils/GeoComm/home_services.html)	
	YES	BLM_MAP_OIL_AND_GAS	http://www.blm.gov/nils/GeoComm/home_services.html)	
	YES	BLM_MAP_SOLAR_ENERGY	http://www.blm.gov/nils/GeoComm/home_services.html)	
	YES	BLM_MAP_WIND_ENERGY	http://www.blm.gov/nils/GeoComm/home_services.html)	
	YES	Detailed oil & gas field maps	http://www.eia.doe.gov/pub/oil_gas/natural_gas/analysis_publications/maps/maps.htm#geodata	
	YES	Developable Area and Strata Unit Area	http://ostseis.anl.gov/guide/maps/index.cfm	
	YES	Energy Distribution Control Facilities	http://www.globalenergymaps.com/ or R:\wildlifei\data_105\energy_dev\grsgmdl06_inputs\globalenergy\GE_Data_09-28-07	
	YES	EPCA3	http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/EPCA_III/EPCA_III_geodata.html	
	YES	fema	http://www.nrel.gov/gis/data_analysis.html	
	YES	Geothermal_Potential_Area.zip	http://eco.mdainformationsystems.com/Members/pdlattin/	

APPENDIX 12. (Continued). Preliminary datasets for potential inclusion in Human Footprint layers for the Colorado Plateau REA.

CONDITIONAL FOOTPRINT	ENERGY RELATED	FILE_NAME	FILE_LOCATION	NOTES
	YES	Global Horizontal Solar	http://www.nrel.gov/gis/data_analysis.html	
	YES	Known Geothermal Resource Areas, Geothermal Lease Status, Biomass Development Areas, Concentrating Solar Power, Flat plate collector solar resource data, wind power classes	http://www.nrel.gov/docs/fy03osti/33530.pdf	
	YES	LATITL	http://www.nrel.gov/gis/data_analysis.html	
	YES	NFS_Lands_In_Potential_Area.zip,	http://eco.mdainformationsystems.com/Members/pdlattin/	
	YES	Oil and Gas Wells in the Western United States (NOGA 1994)	http://sagemap.wr.usgs.gov/HumanFootprint.aspx	
	YES	Oil/Gas	http://ostseis.anl.gov/guide/maps/index.cfm	
	YES	Oil/Gas Leases	http://www.geocommunicator.gov/NILS-PARCEL2/map.jsp?MAP=ENERGY	
	YES	Tbd_Lease_Sites.zip	http://eco.mdainformationsystems.com/Members/pdlattin/	
	YES	Potential Geothermal Area	http://www.blm.gov/wo/st/en/prog/energy/geothermal/geothermal_nationwide/Documents/GIS_Data.html	

APPENDIX 12. (Continued) Preliminary datasets for potential inclusion in Human Footprint layers for the Colorado Plateau REA.

CONDITIONAL FOOTPRINT	ENERGY RELATED	FILE_NAME	FILE_LOCATION	NOTES
	YES	Public_Lands_in_Potential Area.zip,	http://eco.mdainformationsystems.com/Members/pdlattin/	
	YES	Section 368 Energy Corridors	http://corridoreis.anl.gov/eis/fmap/gis/index.cfm	
	YES	Significant Electric Power Generation Plants	http://www.globalenergymaps.com/ or R:\wildlifei\data_105\energy_dev\grsgmdl06_inputs\globalenergy\GE_Data_09-28-06	
	YES	Substations and Taps in North American Power Grid	http://www.globalenergymaps.com/ or R:\wildlifei\data_105\energy_dev\grsgmdl06_inputs\globalenergy\GE_Data_09-28-08	
	YES	Wind Resources	http://www.nrel.gov/gis/data_analysis.html	
		2009 Cropland Data Layer	http://www.nass.usda.gov/	
		AgriCultural Land in the Western United States	http://sagemap.wr.usgs.gov/HumanFootprint.aspx	
		Agriculture Census of the United States	http://www.nationalatlas.gov/atlasftp.html?openChapters=%2Cchpagri#chpagri	
		All Interstates and Federal Highways in the Western United States	http://sagemap.wr.usgs.gov/HumanFootprint.aspx	
		All interstates in the Western United States	http://sagemap.wr.usgs.gov/HumanFootprint.aspx	

APPENDIX 12. (Continued) Preliminary datasets for potential inclusion in Human Footprint layers for the Colorado Plateau REA.

CONDITIONAL FOOTPRINT	ENERGY RELATED	FILE_NAME	FILE_LOCATION	NOTES
		All State and Federal Highways in the Western United States	http://sagemap.wr.usgs.gov/HumanFootprint.aspx	
		Anthropogenic Fragmentation in the Western United States	http://sagemap.wr.usgs.gov/HumanFootprint.aspx	
		Landfills in the Western United States	http://sagemap.wr.usgs.gov/HumanFootprint.aspx	
		Mineral Resource Data System	http://tin.er.usgs.gov/mrds/	
		NLCD Impervious Surfaces	http://www.mrlc.gov	
		NLCD Land Cover Change	http://www.mrlc.gov	
		NLCD Landcover	http://www.mrlc.gov	
		Populated areas in the Western United States	http://sagemap.wr.usgs.gov/HumanFootprint.aspx	
		Population Density in the Western United States	http://sagemap.wr.usgs.gov/HumanFootprint.aspx	
		Rest Areas in the Western United States	http://sagemap.wr.usgs.gov/HumanFootprint.aspx	
		The Human Footprint in the West	http://sagemap.wr.usgs.gov/HumanFootprint.aspx	

APPENDIX 12. (Continued) Preliminary datasets for potential inclusion in Human Footprint layers for the Colorado Plateau REA.

CONDITIONAL FOOTPRINT	ENERGY RELATED	FILE_NAME	FILE_LOCATION	NOTES
		BLM_FEATURE_MINING_CLAIMS (unpatented active and closed mining claims, Mining Claim Density by Township-Section-Quarter, Mine Plans and Notices)	http://www.blm.gov/nils/GeoComm/home_services.html)	
		BLM_FEATURE_SOLID_MINERALS (coal, phosphate, gilsonite,and other mineral leasing, logical mining units, known geologic structures, mineral material disposal, community pits, and non-mineral land use permits and leases)	http://www.blm.gov/nils/GeoComm/home_services.html)	
		BLM_MAP_MINING_CLAIMS	http://www.blm.gov/nils/GeoComm/home_services.html)	
		BLM_MAP_SOLID_MINERALS	http://www.blm.gov/nils/GeoComm/home_services.html)	
		BLM_SITES (Abandoned mines (from many agencies), BLM recreation sites, BLM campgrounds, BLM buildings, BLM administration sites, BLM bridges, and BLM dams)	http://www.blm.gov/nils/GeoComm/home_services.html)	
		BLM_MAP_CASE	http://www.blm.gov/nils/GeoComm/home_services.html)	

WORKSHOP DATA NEEDS GAP SUGGESTION FORM

(Colorado Plateau Rapid Ecoregional Assessment)

CONTACT INFORMATION

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AFFILIATION:

PHONE NUMBER: ( ) -

EMAIL ADDRESS:

DATA CLASS*	DESCRIPTION	CONTACT

***CLASSES:** Species Conservation Element (list); Site Conservation Element (list); Service/Function (list) Conservation Element; Change Agent (list); Other (list)